Nature Neighbors

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CORN.
(Zea mays).
About ½ Life-size.

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NATURE NEIGHBORS

Embracing

BIRDS, PLANTS, ANIMALS, MINERALS

In Natural Colors by Color Photography

Containing Articles by Gerard Alan Abbott, Dr. Albert Schneider, William Kerr Higley, Thomas Crowder Chamberlin, John Merle Coulter, David Starr Jordan, and Other Eminent Naturalists.
Edited by Nathaniel Moore Banta

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CHAPTER III

MEDICINAL PLANTS

By Dr. Albert Schneider

Medicinal Plants are used in the treatment of diseases. The active principle is usually extracted in some manner, then given internally or applied externally. In some instances the dried plant or plant part is reduced to a powder and taken internally. Some medicinal plants are found in the wild state only, but most of them are also cultivated.

Medicinal plants have been in use since time immemorial, and at some time nearly every known plant has been tested and used medicinally, whether it possesses any healing powers or not. The tendency at the present time is to reduce the number of drugs, and, hence, drug-yielding plants. Not so many years ago the physician prescribed hundreds of different species of plants, while the modern physician rarely uses more than twenty-five or thirty. Many plants still retained in the official list might as well be excluded, as they have practically no medicinal virtue.

Our most valuable medicinal plants are also poisonous, a fact well worth remembering. There are, however, many poisonous plants which are not used medicinally.

FOXGLOVE

The Foxglove is a biennial herb from two to seven feet in height, with a solitary, sparingly branched stem. The basal leaves are very large and broad, gradually becoming narrower and smaller toward the apex of the stem and its branches, dark green in color, pubescent, margin dentate, venation very prominent. The inflorescence is very characteristic. The large, numerous flowers are closely crowded and pendulous from one side of the arched stalk. The corolla is purple and spotted on the inside. It is a very handsome plant, widely distributed, preferring a sandy or gravelly soil in open woods. When abundant and in full bloom it makes a beautiful exhibit. It is a garden favorite in many lands.

Modern physicians consider digitalis one of the most important medicinal plants. It is a very powerful, hence very poisonous drug, its action being due to an active principle known as *digitalin.* Its principal use is in the treatment of deficient heart action.

For medicinal use the leaves from the wild-growing plants are preferred, because they contain more of the active principle. The leaves are collected when about half of the flowers are expanded, and, since it is a biennial, that would be during the second year. The first year leaves are, however, often used or added. Like all valuable drugs, it is often adulterated. The odor of the bruised green leaves is heavy or nauseous, while that of the dried leaves is fragrant, resembling the odor of tea. The taste is quite

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FROM KŒHLER'S MEDICINAL-PFLANZEN.

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SWEET FLAG.
(Acorus calamus.)

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bitter. Formerly the roots, flowers, and seeds were also used medicinally.

Description of plate: A, B, plant somewhat reduced; 1, flower; 2, 3, 4, stamens; 5, pollen; 6, 7, style and stigma; 8, 9, ovary; 10, fruit; 11, 12, 13, seed.

CALAMUS

Acorus calamus, commonly known as Calamus, Sweet Flag, and Cinnamon Sedge, is a reed-like plant common in Europe and North United States. It grows in swamps, marshes, and very moist places. It is a herbaceous perennial growing from spreading, fleshy rhizomes. The long, sword-like, deep green pointed leaves grow up from the rhizomes.

Calamus has ever been a favorite popular remedy. Its principal use seems to have been that of a tonic and blood purifier, for which purpose bits of the dried rhizomes are masticated and the saliva swallowed. It undoubtedly is a tonic, and it also has a beneficial stimulating and antiseptic effect upon gums and teeth. Chewing the rhizomes is also said to clear the voice. Calamus is, or has been, used in flavoring beer and gin. Country people add it to whisky, wine, and brandy to make a tonic bitters for the weak and dyspeptic. It is said that the Turks employ it as a preventive against contagious diseases. In India it is used to destroy vermin, especially fleas. In England it is employed in the treatment of malaria.

At the present time calamus is no longer extensively employed in medicine. It is considered as a stimulating, aro-

matic, and bitter tonic. It is perhaps true that its value as a tonic is at present somewhat underestimated by the medical profession. It is also serviceable in flatulent colic, and in what is designated as atonic dyspepsia. It is added to other medicine, either as a corrective, or adjuvant.

Description of plate: A, rhizome and basal portion of leaves; B, upper end of leaf with inflorescence (spike); 1, 2, 3, 5, flowers; 4, stigma; 6, section of fruit; 7, stamens; 8, pollen grains.

THYME

The field or wild Thyme is a small, much-branched shrub, about one foot high, with rather slender, quadrangular, purplish, pubescent stems. Leaves small, opposite, sessile. Flowers numerous, in clusters in the axils of the upper leaves. Corolla purplish, irregular; calyx green and persistent. The plant is propagated by means of underground stems. It is far from being a showy plant.

This plant is closely related to the garden thyme, and grows profusely in meadows, fields, and gardens. Both species are very fragrant, and it is to this characteristic that they owe their popularity. The ancient Greeks and Romans valued thyme very highly and made use of it as a cosmetic, in medicine, and in veterinary practice, much as it is used at the present time. Thyme yields the oil of thyme, which is a valuable antiseptic, used as a gargle and mouth wash, for toothache, in dressing wounds and ulcers, also for sprains and bruises, in chronic rheumatism, etc. It finds extensive use in the preparation of perfumes and scented soaps; but its principal value is in veterinary practice. The herb is

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much used as a flavoring agent in soups and sauces, in fomentations, in baths, and in the preparation of scented pillows.

Two kinds of oil of thyme appear upon the market, the red oil and the white oil. The latter is less aromatic, being the product of redistillation. The oil is also known as oil of origanum.

Although thyme is an insignificant plant, as far as appearances are concerned, yet it has been sung by many poets.

Description of plate: A, plant somewhat reduced; 1, 2, leaves; 3, flower bud; 4, 5, flower; 4, 5, 6, 7, 8, different views of flower; 9, flower without stamens; 10, stamens; 11, pollen grains; 12, 13, pistil; 14, developing fruit; 15, transverse section of fruit; 16, ripening fruit; 17, 18, 19, seed.

MAY-APPLE

The May-apple is a small perennial herb with long root-stalks or underground stems, a native of the United States and Canada, growing in rather moist woodlands. The entire plant attains a height of about twelve inches. The leaves are large, peltate (from *pelta,* small shield), margin deeply cleft, from five to nine lobed, lobes pendant, thus giving the leaf a semblance to an umbrella. It is remarkable that the flowerless plants have only one leaf, while the flowering specimens always have two, which are opposite upon the stem apex, carrying the flower in the bifurcation as shown in the illustration.

Each plant bears a single flower upon a drooping stalk.

The calyx consists of six greenish sepals, which, however, drop off as soon as the flower begins to unfold. The corolla consists of six or nine petals, which are quite large, thick, and pulpy, and of a creamy-white color. Authorities seem to differ as to the odor of the flower. Some speak of it as very fragrant; others designate it as nauseous, and others express no opinion. It is an undoubted fact that the rhizomes, stems, and leaves have a very heavy, nauseous odor, and it is not unreasonable to assume that this odor is traceable in flower and unripe fruit.

The flowers expand in May and the fruit ripens in August. The fruit is a berry about the size of a plum. At first green, it changes to a soft yellow at maturity. It is not unlike a tomato in general appearance. When fully ripe it has a fragrant odor and tastes somewhat like the paw-paw.

The principal use of the American mandrake is medicinal. It is a very efficient cathartic.

Description of plate: A, B, parts of the plant, about natural size; 1, flower bud; 2, flower; 3, stamens; 4, ovary; 5, fruit; 6, seed coat; 7, seed.

TOBACCO

The Tobacco plant is a tall herbaceous annual with large simple leaves and terminal inflorescence, belonging to the nightshade family, the members of which resemble each other in that they are more or less poisonous and in that they have a disagreeable, nauseous, heavy odor.

There are several species of tobacco, of which the above is the most highly valued, and they are all natives of warm

TOBACCO.
(Nicotiana tabacum).

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FROM KŒHLER'S MEDICINAL-PFLANZEN.

CUBEBS.

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countries, as southern Asia, India, South America, and the West Indies. Tobacco is very extensively cultivated in nearly all warm countries, especially in the southern United States and the West Indies.

Tobacco requires rich soil and careful cultivation. The seed is sown in a hotbed or in a sheltered place in the open. The plants are set from April to June. The ground is carefully tilled, freed from weeds, and the plants watched for cutworms and the big green tobacco worm, which are very destructive. Worms and eggs must be removed and destroyed. To increase the size of the leaves and hasten maturity, the flowering tops are broken off. When the leaves are matured, which is indicated by a yellowish mottling, the plants are cut off close to the ground, fastened in groups of six to eight, and dried.

All unprejudiced authorities are agreed that the habitual use of tobacco acts injuriously upon the system, no matter in what form or manner it is used.

Medicinally, tobacco is but rarely used now. With nonsmokers it is useful to relieve asthma. Formerly it was quite extensively employed in spasmodic affections and in parasitic skin diseases.

Description of plate: A, flowering stem; 1, floral parts; 2, stamen; 3, pollen; 4-8, ovary and pistil; 9, 10, seed.

CUBEBS

The Cubeb-yielding plant is not unlike the pepper plant, and belongs to the same family. The two resemble each other in general habits in the form of inflorescence and in

the fruiting. Cubebs were known to Arabian physicians as early as the ninth century, who employed them as a diuretic in kidney troubles. It was also known at that time that Java was the home of the plant. During the twelfth and thirteenth centuries it was employed medicinally in Spain. Originally it was doubtless employed as a spice, similar to pepper. At the beginning of the nineteenth century cubeb disappeared almost entirely from medical practice. About 1820 English physicians of Java again began to employ it quite extensively.

As in the case of black pepper, the fruit is collected before maturity and dried. The fruit is about the size of the pepper, but has a stalk-like prolongation which distinguishes it. The pericarp becomes much shriveled and wrinkled on drying.

Cubebs are cultivated in special plantations or with coffee, for which they provide shade by spreading from the trees which serve as their support. Their cultivation is said to be easy.

Cubebs have a pungent, bitter taste and a characteristic aromatic odor. It cannot readily be confounded with any of the other more common spices. Its use as a spice is almost wholly discontinued. The use of cubebs in medicine is also waning, since it evidently has only slight medicinal properties. It is used in nasal and other catarrhal affections.

Cubeb cigarettes are used in the treatment of nasal catarrh. It has a marked influence upon the kidneys, causing irritation and increased activity, and, as already indicated, it is, therefore, a diuretic. It is, however, harmful

A. Staminate flowers. B. Pistillate flowers. C. Fruiting branch. 1. Staminate flower. 2 Calyx of the sepals. 3 4 Stamens. 5. Pollen. 6. Pistillate flowers in head. 7-12. Pistils and stamens. 13. Fruiting head. 14-20. Forms of achenes and cupules.

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rather than beneficial in acute inflammatory conditions of these organs.

Description of plate: A, twig with staminate flowers; B, fruit-bearing twig; 1, upper portion of staminate inflorescence; 2, staminate flower; 3, fruit; 4, 5, 6, 7, ovary; 8, 9, seed.

HOPS

The Hop has been called the Northern vine. It is found in a wild state throughout Europe, excepting the extreme North, and extends east to the Caucasus and through Central Asia. It is a handsome plant and not infrequently used as an arbor plant. The lower or basal leaves are very large, gradually decreasing in size toward the apex.

Hops is also cultivated in Brazil and other South American countries, Australia, and India.

The principal use of hops is in the manufacture of beer, to which it imparts the peculiarly bitter taste, and its repute as a tonic. For this purpose enormous quantities are consumed in Germany and England. The exhausted hops from the breweries form an excellent fertilizer for light soils. The leaves have been used as fodder for cows. Leaves, stems, and roots possess astringent properties and have been used in tanning. In Sweden the fiber of the stem is used in manufacturing a very durable white cloth, not unlike the cloth made from hemp and flax.

Hops is used medicinally. It at first causes a very slight excitation of brain and heart, followed by a rather pronounced disposition to sleep. Pillows stuffed with hops form a very popular domestic remedy for wakefulness.

Hop bags dipped in hot water form a very soothing external application in painful inflammatory conditions, especially of the abdominal organs. It has undoubted value as a bitter tonic in dyspepsia and in undue cerebral excitation.

Description of plate: A, staminate (male) inflorescence; B, pistillate (female) inflorescence; C, fruiting branch; 1, staminate flower; 2, perigone; 3, stamen; 4, open anther; 5, pollen; 6, pistillate catkin; 7, 8, 9, pistillate flowers; 10, scales; 11, 12, 13, scales and flowers; 14, 15, fruit; 16, 17, 19, seed; 20, resin gland (lupulin).

DANDELION

Dandelion is a perennial herb thoroughly familiar to every one, as it is found almost everywhere throughout all temperate and north temperate countries.

The poor of nearly all countries collect the young, crisp leaves in the early spring and prepare therefrom a salad, resembling lettuce salad.

The leaves are also cooked, usually with leaves of other plants, forming "greens," highly relished by many people.

The principal use of this plant has thus far been medicinal, but its value as a curative agent certainly has been overrated. It has been used in dropsy, pulmonary diseases, in stomach derangements, in hepatic or liver disorders, in icterus, blotchy skin, and other skin diseases, for biliary calculi, in hypochondriasis, etc. It has no marked curative properties in any disorder. Beyond mildly laxative and tonic properties, it has no effect whatever. Using taraxacum preparations for a considerable length of time causes diges-

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tive disorders, mental excitement, vertigo, coated tongue, and nausea.

In lawns, the plant proves a great nuisance, as it displaces the grass, and it is difficult to exterminate. The plants must be dug up, roots and all, carted away, and burned. This should be done early, before the seeds are sufficiently mature to germinate. For medicinal use the roots are gathered in March, July, and November, cleaned, the larger roots cut longitudinally, dried, and packed, to be shipped to points of consumption. The juice expressed from the fresh roots is also used.

COCA

Coca and Cuca are South American words of Spanish origin, and apply to the plant itself as well as to the leaves. The plant is a native of Brazil, Peru, and Bolivia. It is a shrub varying in height from three to ten feet. The leaves resemble the leaves of tea in general outline. The margin, however, is smooth and entire, the leaf-stalk (*petiole*) short; upper and lower surfaces smooth; they are rather thin, leathery, and somewhat bluish-green in color. The characteristic feature of the leaf is two lines or ridges which extend from the base of the blade, curving out on either side of the midrib and again uniting at the apex of the leaf. The flowers are short-pedicled, small, perfect, white or greenish-yellow, and occur singly or in clusters in the axil of the leaves or bracts. The shrub is rather straggling and not at all showy.

The plants are grown from seeds sown in pots or boxes,

in which they are kept until they are from eight to ten inches high, after which they are transplanted during the rainy season. Coca thrives best in a warm, well-drained soil, with considerable atmospheric moisture. In the Andes region an elevation of 2,000 feet to 5,000 feet is most suitable. The young growing plants must be protected against the heat of the sun. The maximum growth is attained in about five years.

The leaves are the only parts used, although the active principle, cocaine, is present in small quantities in all parts of the plant. As soon as the shrubs are several years old the leaves are picked, usually several times each year.

Coca leaves have been used for many centuries by the natives of South America, who employed them principally as a stimulant, rarely medicinally.

Description of plate: A, flowering branch; 1, bracts, enlarged; 2, flowering bud; 3, flower; 4 and 5, petal with ligula; 6, pistil with stamens; 7, stamen; 8, pistil; 9, ovary, transverse section; 10 and 11, corolla; 12 and 13, fruit.

THE POPPY

The opium-yielding plant or Poppy is an herb about three feet in height; stem of a pale green color, covered with a bloom. Branches are spreading, with large, simple, lobed, or incised leaves. The flowers are solitary, few in number, quite large and showy. The four large petals are white or a pale pink color in the wild growing plants. The fruit is a large capsule, one to three inches in diameter, of a depressed globular form. The seeds are small and very

POPPY.

(Papaver.)

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A. White Poppy. B. Carnation Poppy. 1. Pistil and Stamens. 2. Stamens (magnified). 3. Grain of Pollen. 4. Pistil. 5. Cross section of Pistil. 6. Ripe Capsule. 7, 8 and 9. Seed.

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numerous, filling the compartments of the capsule. In spite of the general attractiveness of the plant, the size of the flowers, and the delicate coloring of its petals, it is not a favorite at close range, because of a heavy nauseating odor which emanates from all parts of the plant, the flowers in particular. The petals, furthermore, have only a very temporary existence, dropping off at the slightest touch.

The wild ancestor of our familiar garden poppy is supposed to be a native of Corsica, Cyprus, and the Peloponnesian Islands. At the present time it is extensively cultivated everywhere, both as an ornamental plant and for its seeds, pods, and the yield of opium. It has proven a great nuisance as a weed in the grain fields of England, India, and other countries — something like mustard in the oat fields of the Central States. There are a number of forms or varieties of the cultivated poppy. The red poppy, corn poppy, or rose poppy is very abundant in southern and central Europe and in western Asia. It has deep red or scarlet petals and is a very showy plant. The long-headed poppy has smaller flowers of a lighter red color and elongated capsules, hence the name. The Oriental poppy has very large, deep red flowers on a tall flower-stalk.

Description of plate: A, flowering plant, white variety; B, flower of red variety; 1, pistil and stamens; 2, stamen; 3, pollen grains; 4 and 5, pistil; 6, ripe capsule; 7, 8, 9, seed.

LICORICE

The licorice-yielding plant is a perennial herb with a thick rootstock, having a number of long, sparingly branched roots and very long runners or rhizomes. It belongs to the same family as the peas and beans. It has purplish flowers with the irregular corolla characteristic of the family. The pods are rather small, much compressed, each with from two to five seeds.

The plant is in all probability a native of the warm parts of the Mediterranean region. There are several varieties, all of which are more or less extensively cultivated and placed upon the market.

Licorice is extensively cultivated in Greece, Italy, France, Russia, Germany, the Danubian Provinces, southern China, northern Africa, and to some extent in England. In the Italian province of Calabria, licorice is planted with peas and corn. In the course of three years the roots are collected, the juice expressed, and the root evaporated to the proper consistency for shipping. New crops are grown from cuttings of the rhizomes. There is an excellent quality of licorice grown in the vicinity of Smyrna. The principal commercial varieties are grown in Spain, southern Russia, Turkey, and Italy. Spanish and Russian licorice root is dried and shipped in bales or bundles. Spanish licorice root is unpeeled and occurs in pieces several feet in length. Russian licorice is usually peeled. Most of the licorice used in the United States is obtained from Italy, Russia, and Germany.

LICORICE.

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Some of the licorice found upon the market is quite fragmentary and very dirty. The licorice raised in England is intended for home consumption and is placed upon the market in both the fresh and dried state. The fresh roots have an earthy and somewhat nauseous odor.

Description of plate: A, flowering portion of plant; 1, flower; 2, 3, 4, parts of the flower; 5, stamens; 6, stigma; 7, ovary; 8, fruit; 9, one valve of pod with seeds; 10, 11, 12, different views of seed.

IRISH MOSS

Chondrus crispus, the plant of our sketch, is a sea weed of the Atlantic. It is quite plentiful along the shore lines of the Atlantic States, Ireland, and England. It is commonly known as Irish Moss, though it is not a moss at all. It is also known as Carrageen Moss or Carrageen. It is a perennial plant, three to ten inches high, consisting of a flat, much-branched thallus, as shown in the illustration. It is variable in its coloring, greenish-purple, purplish-brown, grayish-purplish-brown, etc., somewhat waxy or translucent in appearance. It is also very variable in form, no two specimens being exactly alike. It attaches itself to rocks, pebbles, and boulders by means of a basal disk which serves merely as a mechanical support, the frond or thallus absorbing its nourishment from the sea water. In consistency the plant is cartilaginous, mucilaginous, and is entirely dissolved on boiling. When dry it becomes very hard, brittle, and elastic and assumes a light-yellowish, translucent appearance. *Chondrus crispus* is closely similar to *Gigartina*

mamillosa, another sea weed, with which it is usually associated.

Irish moss is extensively collected along the coast of Massachusetts, the plants being spread high up on the beach to dry and bleach in the sun. Its principal use is in medicine, although it has, perhaps, no curative properties in itself. It is a demulcent and emollient, that is, the mucilage present tends to allay irritation of inflamed mucous membranes, as in sore throat, pulmonary complaints, etc. It has been extensively employed as a popular remedy in dysentery, kidney troubles, and pneumonia. Its principal use at the present time is as an article of diet, in the preparation of soup, blanc mange, and jellies. Sometimes it is combined with chocolate or cocoa, sugar, lemon juice, etc., to improve the flavor.

Description of plate: A, B, C, D, different forms of Irish moss; E, F, forms of *Gigartina mamillosa;* 1, section of thallus of *G. mamillosa;* 2, 3, 4, sections of *Chondrus crispus.*

CHAPTER IV

WATER PLANTS

JOHN M. COULTER

Professor of Botany, University of Chicago

WHEN one thinks of life in the water, he is apt to think only of animals, such as fishes, lobsters, oysters, etc. But plants are living things, and the water is full of them, from those that are so small that we need the microscope to see them, to the great sea-weeds whose huge bodies, sometimes hundreds of feet long, float on the water.

Every one who has seen springs, or pools, or ditches full of water, or our beautiful little lakes, must have noticed the plants which either float on the surface, sometimes looking like a green scum, or, rooted in the mucky soil, spread out their leaves beneath the water.

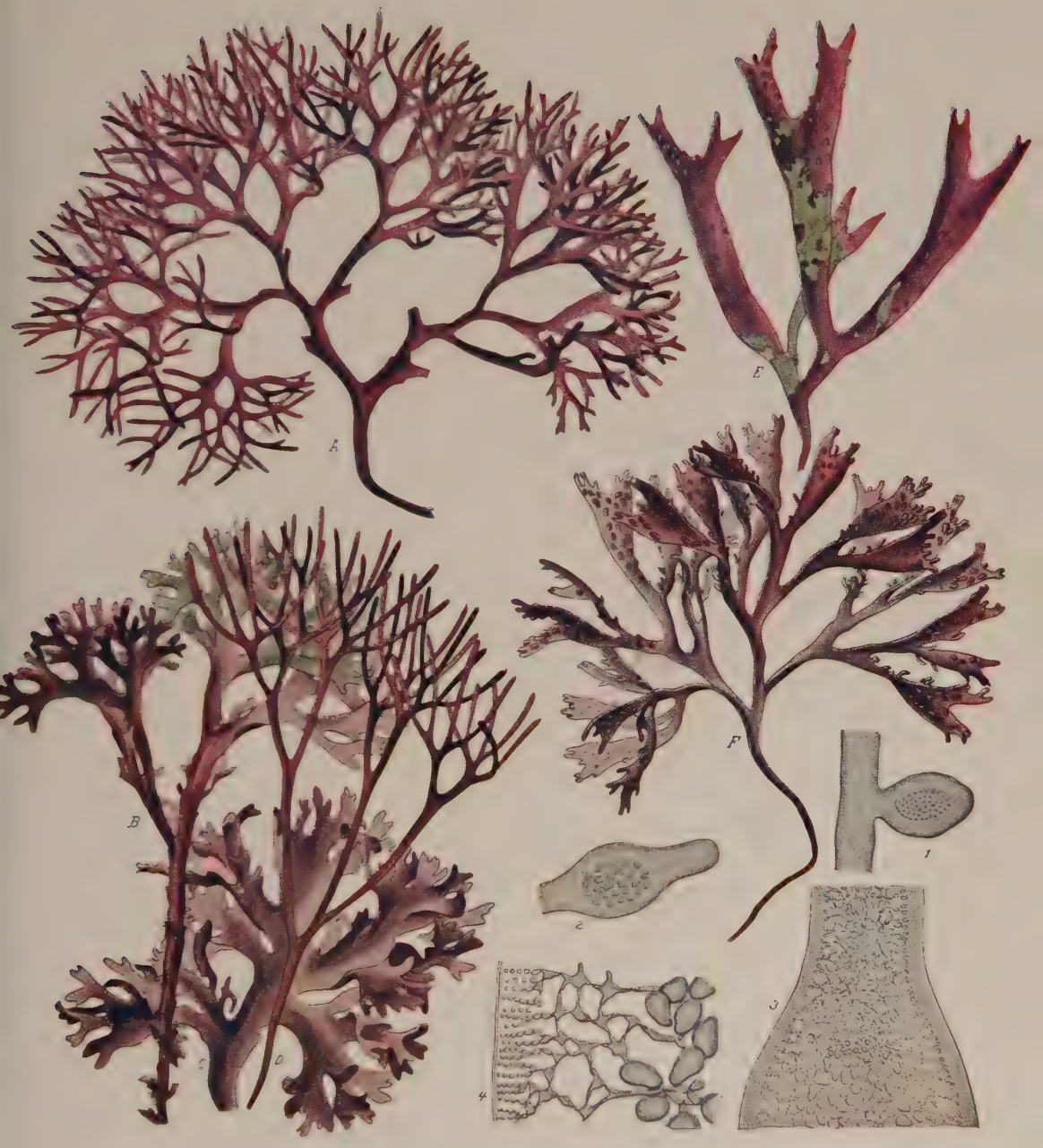
When a boy, I lived where springs were abundant, the cool water collecting in basins and running over the rocks below. I always noticed in and about these springs green, thready masses, which felt slippery to the touch and collapsed into a pulpy mass when taken from the water. The boys used to call this "frog spittle," and they firmly believed that these masses had something to do with the frogs. Years afterwards I learned that these green threads were plants, and very beautiful ones when looked at with a microscope. Since then I have seen these thready plants in all waters, sometimes coarse looking, sometimes as delicate as a green

film. I have learned to call them all "sea-weeds," although many of them live in fresh water; or the better name for them is "algae."

While most of the algae of fresh waters are green, most of those which live along the sea-coasts are very differently colored. Any one who has spent a summer at the sea-shore has been interested in the many brightly-colored plants of curious forms which are thrown up by the waves on the beach, or are to be seen clinging to the rocks beneath the water, or within reach of the tides. The browns, and yellows, and olive greens, the brilliant reds and purples, never fail to excite admiration. The bodies of these plants are sometimes like long, yellow straps, sometimes like aprons (known as "devil's aprons"), sometimes like the most delicate red ferns and mosses. So charming are they that many a collection of the smaller forms is made as a souvenir, the delicate, filmy bodies being floated on cardboard, to which they stick fast by a mucilage of their own making.

As one goes from our own Atlantic coast southward towards the tropics, these sea-weeds become more brilliant in color and more varied in form, until within the tropics there is no flower-garden more gorgeous in color or beautiful in form than the masses of sea-weeds found along the rocky coasts.

Perhaps the most famous sea-weed is that huge one called "Sargassum," or "Gulf-weed," well known since the voyage of Columbus. It is met with in floating masses in all oceans, having been broken away from the coasts. Wherever there is a great ocean eddy, this Gulf-weed collects in great quantity, having given name to that ocean region of the North



FROM KŒHLER'S MEDICINAL-PFLANZEN.
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IRISH MOSS.

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Chondrus crispus.

Gigartina mamillosa.

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Atlantic known as the "Sargasso Sea." It was these floating sea-weeds that Columbus met during his first voyage, and which he took to indicate the near presence of land.

But algae are not the only plants that love the water. Sometimes in the summer I have gone fishing in the lakes of northern Michigan, and, as the boat floated slowly, I could see far down in the clear water clumps of plants whose leaves looked like ribbons, or sometimes broader. Occasionally the fishing-hook would bring some of them to the surface, and they always had a pallid and translucent look. Sometimes there were plants with feathery sprays of thread-like leaves that would collapse when pulled out of the water. The light that reaches these plants through the water has lost much of its intensity, and is not strong enough to develop in them as much green as in those growing in the open air, and so they look pale when compared with the vivid green of land plants. Some of these leafy submerged plants are known as "pickerel weeds," and patches of them are known as "pickerel beds," for among them this large and sluggish fish finds his favorite feeding-ground. The experienced fisherman does not drop his line at random in such a lake, but peers into the water until he discovers the dim outlines of pickerel weeds, and then he anchors to try his fortune.

Perhaps the water plants most common for their beauty are the water-lilies, whose broad leaves, known as "lily pads," float on the water, and among them there rises to the surface and bursts into brilliant bloom a flower looking like a huge white rose. There can be no plant display more charming than a pond or sluggish stream covered with dark green lily pads and spangled over with pure white blossoms. But

water-lilies are not all white, for some are a beautiful pink, or red, or yellow, and one is a brilliant blue. The common "yellow water-lily" of our own region, known as "spatter-dock," does not float its leaves, and the flower does not compare in beauty with its more prized relative, the white lily. Down in the deep, mucky bottom of the ponds or shallow lakes the large roots of these lilies are found, and the deeper the water the longer the leaf stems and flower stems, for both leaf and flower must come to the surface. How long these stems often are, and how tough they are, any one who has collected water-lilies by leaning over the edge of an uncertain boat knows full well.

In the region of the Amazon, especially along its tributaries, there is a water-lily famous for its size, as well as beauty, and known as the "Victoria" or "royal water-lily." Its great leaves or "pads" rest like huge platters on the water, often eight to ten feet in diameter, and with an upturned edge. So strong are they that they are like rafts, upon which large water birds can stand. Some of these leaves have been reported to be so large and strong that they are able to sustain the weight of two men.

Some of the mosses are famous water plants, delighting in bogs. Some of them take entire possession of bogs, filling them up completely with their cushion-like masses. Such mosses can keep growing upwards, living branches growing up from those that are dying below, until often a very deep bog is filled up. These "bog mosses" form those trembling, quaking, treacherous morasses, called "mosses" in Scotland, which are often impassable, and into which many animals and men have sunk. The waters in these bogs have great

preservative power, so that the submerged animals do not entirely decay, and many years afterwards, sometimes thousands of years, they have been dug up. Such bogs are famous places in which to find the skeletons of certain animals that are no longer living upon the earth. Those old giant elephants, known as mammoths and mastodons, which once roamed in great herds throughout America, have been made known to us chiefly by having mired in such bogs while in search of food. We have dug up many of their preserved skeletons, and have never ceased to wonder at them.

But the moss bogs have done something much more useful to us than the preservation of the skeletons of strange animals. Deep down in the bottom of these moss-choked bogs the mass of dead moss has been changed into a substance something like soft coal, known as "peat," used by many people for fuel. This use of peat for fuel is very familiar to those who have read of peasant life in Great Britain, in parts of which peat bogs abound. There are many such bogs in our own country also, chiefly in the northern states.

Besides the plants that live in the water or float upon it are others that simply stand in the water. They usually fringe the shallow shores of lakes, or live in very wet swamps. Foremost among them is the bulrush, whose tall, naked, wand-like stems stand in shoal water like an advance guard of land plants. This is what they really are, for the sand and silt are caught and held by them, and the shoal water presently becomes only a swampy place, where sedges and grasses grow. In this way the land invades the water, and the bulrushes push further out on the water frontier.

Usually nearer the land than the bulrushes there may be luxuriant growths of "reed-grasses," prominent among which is the wild rice. This wild rice sometimes grows in great meadow-like stretches over swampy areas, a perfect jungle of tall grass. When the rice-like grain is ripe, thousands of birds find an unfailing feeding-ground in these wild rice swamps. The Indians, too, knew these rice fields well and harvested the grain extensively. All who know anything about the cultivation of our commercial rice will remember that it also is a reed-grass which stands in the water.

Even certain trees delight in the water, and the most famous of these in our country is the bald cypress. In the swamps of the southern states, and extending as far north as the swampy stretches of the Lower Wabash, these interesting trees grow. Probably the best-known "cypress swamp" region is the Great Dismal Swamp of Virginia and North Carolina. The great trunks rise thickly from the water or boggy soil, and the deep shadows of the trees and the dark pools and treacherous ground beneath them make a very forbidding and uncanny combination. To help support themselves in the trembling soil, the trunks send out great buttresses about their base, which thus seems to be divided up into a circle of deep chambers. As the wide-spreading roots must have air to breathe, which they cannot get beneath the waters of the swamp, they send up above the surface curious conical growths known as "cypress knees." These knees are so constructed that air can enter them and so pass down into the roots. If the water of the swamp rises higher than usual, and the knees become submerged, the trees are literally drowned. These knees, rising

here and there through a swamp, are often called "hummocks"; and if they are close enough together, a bad swamp may be crossed by jumping from hummock to hummock, the only safe footing.

The most curious of water trees is the mangrove, which grows in great communities along the river banks and seacoasts of tropical countries, where the water is quiet and salty. They form the well-known "mangrove swamps," regular water thickets, where the stagnant, foul-looking water is thickly set with scraggy stems and curious, stilt-like roots. The rubbish from the land becomes entangled in this thicket-like growth, the water becomes filled up, and the mangroves march on with the receding water. The mangrove tree, branching in awkward fashion, sends down a multitude of roots from its trunk and branches, and looks like a huge worm, with many long, stilt-like legs which divide into toes before they reach the ground or shallow water.

Their most curious habit remains to be told. In most plants the fruits or seeds drop from the parent plant, or are carried away, and after an interval the seeds begin to sprout and new plants grow up. Not so with our mangrove. The fruit is shaped like a pear, except that the stem is at the broad end. These pears hang suspended, but they never drop, nor do the seeds drop. In each fruit a single seed begins to sprout, and presently the growing root bores through the fruit and appears at the small end of the pear. The root grows longer and longer, until presently it looks like a long, thick cord, dangling from the fruit, sometimes becoming fifteen or twenty inches long. A tree with stilt-like legs and full of dangling roots hanging over mucky

water is a curious sight. Presently, one by one, the young plants free themselves from the fruit, and drop like plumb-bobs into the muck below, the heavy root sticking into the mud, and the young plant in position to unfold its leaves and begin its independent life. These young plants fall with such force that they can penetrate a considerable depth of water and stick fast into the muddy bottom. If the water is too deep, however, they simply float upon it, and sooner or later may reach water so shallow that the roots can seize hold of the bottom.

But we have not room even to speak of the prominent plants that love the water. Their name is legion, and they must learn to do many things which are not demanded of plants which grow upon the dry land.

CHAPTER V

FRUITS, NUTS, ETC.

Broadly speaking, Fruits are as multitudinous in variety as are the species of flowering plants upon which they grow. When the term fruit is used in ordinary language, we generally have in mind those fruits which are edible for man, and it is in this restricted sense that the term is here applied.

Edible fruits are found in all countries and grow upon a great variety of flowering plants. They resemble each other in that they contain a high percentage of water, holding in solution acids, sugar, and other substances in variable quantity. Sub-tropical and tropical countries are usually considered the chief fruit countries. It would be more correct to state that all countries yield fruits in abundance, though each zone has fruit plants peculiar to it.

Botanically considered, a fruit consists of the matured or fully developed ovary enclosing the ripened seeds. According to this definition, apples, pears, quince, pomegranate, strawberry, and others are not true fruits. Apples, pears, etc., consist largely of the modified fleshy calyx, and the strawberry is a much-thickened torus, or receptacle. In some cases only a part of the fruit is edible. There is an outer thin covering, commonly known as the peel, which is often eaten, but which would better be removed by peeling, as it is indigestible and may cause trouble. In some cases (banana, orange, lemon) the peel is very thick and wholly

inedible. In the case of peach, cherry, and plum, the hard endocarp (shell) is inedible. In case of nuts, so called, the seed is the edible portion, while that part of the fruit belonging to the ovary (as hull and shell) is wholly inedible. These nut seeds resemble each other in being very rich in oil and comparatively dry. They are, therefore, difficult to digest and should be eaten only in small quantities at a time.

Most of the stone fruits are not especially palatable, hence they are generally rejected, except such as the sweet almond. ALBERT SCHNEIDER.

THE APPLE

The ancients better appreciated the importance of the Apple than do the moderns, who treat it chiefly as "the embryonic condition of cider or as something to be metamorphosed into pies." It is said to be indigenous to every part of the inhabited globe except South America and the islands of the Pacific. It is equally at home in the fierce heat of the equator and among the frosts of Siberia. In olden times the fig was the index of a native civilization. Later on, the vine was king, but at the present time there are many who maintain that the apple is the only genuine index of civilized man, and claim that it flourishes best in those regions where man's moral and intellectual supremacy is most marked.

The Athenians made frequent mention of the cultivation of the apple, and Pliny enumerates twenty varieties that were known in his day. It is generally supposed that the Goths and Vandals introduced the manufacture and use of

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cider into the Mediterranean provinces, and references to it are made by Tertullian and the African Fathers. The use of cider can be traced from Africa into the Biscayan provinces of Spain, and thence to Normandy. It is supposed to have come into England at the time of the conquest, but the word "cyder" is said to be Anglo-Saxon, and there is reason to believe that it was known in the island as early as the time of Hengist. As the mistletoe grew chiefly on the apple and the oak, the former was regarded with great respect by the ancient Druids of Britain, and even to this day, in some parts of England, the antique custom of saluting the apple trees in the orchards, in the hope of obtaining a good crop the next year, still lingers among the farmers of Devonshire and Herefordshire. During the Middle Ages the fruit was made the pretext for massacring the oppressed tribes of Israel, as it was supposed that the Hebrews used apples to entice children into their homes to furnish their cannibal banquets.

The different varieties of apples have all descended from a species of crab found wild in most parts of Europe. Although there are two or three species of wild crab belonging to this country, yet none of our cultivated varieties have been raised from them, but rather from seeds of the species brought here by the colonists from Europe — over two hundred varieties of apples are known at the present time. As a rule, the apple is a hardy, slow-growing tree, with an irregular head, rigid branches, roughish bark, and a close-grained wood. It thrives best in limestone soils and deep loams. It will not flourish in wet soils or on those of a peaty or sandy character. As a rule, the trees live to be

fifty or eighty years of age, but there are specimens now bearing fruit in this country that are known to be over two hundred years old.

The wood is often stained black and used as ebony. It is also made into shoe lasts, cog-wheels, and small articles of furniture, and is greatly prized in Italy for wood carving and statuary.

New and choice varieties of apples are derived from seeds planted to produce stocks. One stock in ten thousand may prove better than the original, and its virtues are perpetuated by layers, cuttings, graftings, and budding. The tree is not subject to disease. Insects, notably the borer, the woolly aphis, the caterpillar, the apple moth, and the bark louse, have to be guarded against, and several blights occasionally attack the foliage, but as a rule small loss is experienced from these sources. CHARLES S. RADDIN.

THE PEACH

The Peach is one of the most important and best-known fruits.

It is not found in the wild state in its present form, though in some localities it propagates itself, having escaped from cultivation.

It is probably a native of China, where it has been cultivated for centuries and where it is said to reach its greatest perfection.

The number of varieties seems to be unlimited. Over four hundred have been catalogued, though less than one hundred of these are constant. The nectarine is considered

PEACH.
½ Life-size.

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PEARS.
(Pyrus communis).

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a variety and closely related to the peach and the plum, the apricot, and the cherry.

The tree itself, when bearing its beautiful rose-colored, five-petaled flowers, is highly ornamental. It seldom grows higher than twenty feet and its branches form a symmetrical top. One very ornamental variety produces double flowers and bright, shining leaves, but no fruit.

This valuable plant is generally placed in the family *Rosaceæ*, which includes many species of economic and ornamental importance. Besides those already mentioned, here belong the rose, the strawberry, the raspberry, the blackberry, the apple, the pear, and the quince, as well as many beautiful wild forms.

The thousand or more species usually classed in this family may be readily separated into distinct groups, to which are given distinct family names by some authorities. Thus, the peach, the cherry, the plum, and the almond, which resemble each other in regard to the structure of their fruits and in their chemical constituents, may be placed in a family by themselves. WILLIAM KERR HIGLEY.

THE PEAR

The Pear, like the apple and many other forms of fruit, is an inheritance from remote times and crude beginnings. In a special degree it is a triumph of the horticulturists' skill. The thorns which covered the trees that originally flourished in Syria, in Egypt, and in Greece, have long since disappeared, and the one-time acrid fruit has become metamorphosed into the luscious forms which, under many

varietal names, hold the place of the favorite fruit of modern times.

More than to any other source are we indebted to the French Huguenots for the introduction and cultivation of the pear into this country. Many examples of this early cultivation may still be seen in the old trees in Long Island and New Rochelle, in Michigan and Illinois. The introduction by these people of the French method of propagation upon the quince stock gave an immense impetus to the cultivation of the fruit, as by this process the period of fruiting was reduced from twenty to thirty years to three or four years.

The pear, like the apple, peach, plum, cherry, and many other forms, is referred to the *Rosaceæ,* or Rose family. It belongs to the genus Pyrus, which also includes the apple, the crab apple, the mountain ash, and the historical rowan tree. For the most part, the American forms have been derived from the European *Pyrus communis* and the oriental *Pyrus sinensis.* The trees differ in general aspects from the apple tree in possessing a more pyramidal form, in being considerably longer as a seedling plant, and, while less hardy, being longer lived. It is propagated by seeds, cuttings, layers, budding, and grafting, but its sensitiveness to climatic conditions has materially lessened its distribution in the United States.

C. S. Raddin.

BANANA.
⅔ Natural size.

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THE BANANA

The Banana Plant is herbaceous and dies down to the ground after fruiting. The true stem is underground and perennial, sending up new shoots each season, which grow rapidly and in a few months bear ripened fruit.

The stalk that bears the flowers grows to a height of from fifteen to twenty feet and is surrounded by the sheathing bases of the leaves. The flower cluster or spike is terminal and from two to four feet in length and nodding. The oblong leaves are dark green in color, from five to ten feet in length, and from one to two feet in width. The beautifully arching leaves and the pendulous cluster of flowers or fruits form an attractive foliage and make the plant a noted ornament for the garden.

The many varieties of both the banana and plantain, which vary in taste, color, form, and size, are very widely distributed throughout the world, being usually found in a zone bounded by 38 degrees north and 38 degrees south latitude. It is said that a single plant will produce, on the average, in one year three bunches of fruit weighing fifty or more pounds. The amount of labor required in its cultivation is very small, especially in the older plantations.

The number of bananas on a single stalk of the ordinary variety varies from about one hundred to two hundred, with an average of about one hundred and thirty. When a plantation is fully developed growth is so rapid and so constant that ripe bunches of fruit may be gathered each week.

For the best results a good, fertile soil is required. It is interesting to note that but little moisture is needed, for the plants attract water, either from the air or the waters deep under ground, and the surface of the ground is always moist even in a time of unusual drought.

The stalk that bears the heavy bunch of fruit, occasionally weighing as much as eighty pounds, may be easily cut down by a single stroke of a scythe or a machete.

W. K. Higley.

THE ORANGE*

The tree which produces the well-known Orange of commerce is closely related to the lemon, the citron, and the lime, and with them belongs to the genus Citrus.

The Arabian physicians were familiar with the medicinal virtues of the orange and have spoken of it in their writings.

In more recent years the cultivation of the various varieties has spread throughout the world wherever the climate and the conditions of the soil will permit the ripening of the fruit.

Risso, in his valuable history of the Orange family, enumerates one hundred and sixty-nine varieties with distinct characteristics. Of these, he classes forty-three under the *Citrus aurantium*.

Besides the sweet and bitter varieties, the more common ones are the mandarin orange of China, a flat and spheroidal fruit the rind of which easily separates from the pulp; the tangerine, which is very fragrant and originally derived from the mandarin, and the Maltese, or blood orange, commonly grown in southern Italy and notable for its deep red

ORANGES (NAVEL).
(Citrus aurantium).

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pulp. There are many other varieties that bear geographical or local names.

Few forms of plant life present to the beholder more beautiful characteristics than an orange tree in full bearing. Such a tree, in addition to the unripe and ripe yellow fruit, has also numerous white flowers, which give off their wonderful perfume, and its symmetrically arranged branches are covered with rich dark green leaves. It is a tree that appeals not alone to the sense of taste, but to the esthetic nature as well.

THE LEMON

The Lemon is the fruit of a small tree from ten to fifteen feet high. It is not particularly beautiful, being rather shrubby in its appearance. It is an evergreen, bearing leaves, flowers, and fruit all the year round. The flowers occur singly in the axils of the leaves. The calyx is persistent, that is, it does not drop off like the corolla, and may be found attached to the base of the fruit. The corolla consists of five spreading petals of a purplish-pink color.

The lemons of the market are from cultivated plants, of which there are a large number of varieties. These cultivated varieties or forms took their origin from the wild lemon trees native in northern India, in the mountain forests of the southern Himalayas, in Kumoan, and Sikkim.

As the result of cultivation there are now about fifty varieties of lemons in existence. Some of these are comparatively sweet, or rather insipid, and are therefore, known as sweet lemons. The sour varieties are, however, more generally cultivated.

As above stated, the lemon tree bears fruit all the year round, so that a number of crops are gathered annually. There are, however, three principal crops collected, as follows: The first, from July to the middle of September; the second, in November, and the third, in January. Frequently there are also collections in April and in May. The tree is rather delicate; not as hardy as the orange, for example. In upper Italy it even becomes necessary to cover the trees during the winter months. Lemons intended for shipment are picked before they are fully ripe and packed in barrels or boxes holding from four to seven hundred. When exposed the fruit shrinks and loses in weight very rapidly, due to the evaporation of moisture from the pulpy interior.

The following is a description of the excellently colored plate: A is a flowering and fruit-bearing twig, nearly natural size; 1 is a single flower, somewhat magnified; 2, stamens and pistil; 3, ovary in longitudinal sections; 3a, ovary in cross-section; 4, antlers; 4a, pollen-grains; 5, fruit, nearly natural size; 6, cross-section of fruit showing rind, large-celled pulp, and seeds; 7, 8, and 9, seeds.

A. Schneider.

Originally a native of Asia, the Lemon has become widely distributed in Europe, Africa, and America, and, although far more susceptible to injury from frosts than the orange, the trees are successfully cultivated under many conditions. Doubtless the best results in this country have been obtained in California. Thousands of acres around San Diego are planted with lemon trees, while large districts in the Ojai Valley, Ventura, Santa Barbara, Pomona, and

LEMON.

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LIMES.
(Citrus medica acida).
Life-size.

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Los Angeles counties are devoted to its cultivation. The tree is remarkable for beauty, and, while it seldom attains large proportions, its pale green leaves, loosely hanging branches, showy and fragrant flowers, together with the fruit that is found in all stages of development, produce a pleasing and highly ornamental effect. While the best crop of lemons is generally gathered between December and April, the fruit should be picked every month for ten months of the year, in order to retain the best results. As a rule, the trees yield from one hundred and twenty-five to one hundred and forty boxes of the fruit to the acre, about the sixth year, but this number is increased to four hundred boxes when the groves reach an age of ten years.

The varieties of lemons are distinguished chiefly by their size and form, and may be roughly classified as egg-shaped with blunt nipples and oblong lemons with large nipples. The sweet lemon and thin-rind Poncine and Naples belong to the first class, while the second includes such forms as the imperial, the Gæta, and the wax. The principal varieties grown in California are the Lisbon, Eureka, and the Villa-Franca. Of these, the Eureka originated in California, while the Villa-Franca was imported from Europe. Besides the grateful quality of the juice, the expressed oil of the rind is used in the arts and has an intense odor of lemon.

C. S. Raddin.

THE LIME

The Lime belongs to the same genus of plants as the orange, lemon, grape fruit, and citron. The lime, lemon, and citron are closely related and are now considered vari-

eties of the same species, the Latin name of which is *medica,* named by the Romans for the country Media. This species is very valuable, having been greatly modified by cultivation.

The lime is the fruit of a bush or low tree which seldom grows higher than twenty feet. The tree will thrive in quite poor and rocky soil. It is more tender than most of the citrus fruits, and can withstand less cold than the lemon. Its cultivation has, for this reason, been abandoned in many localities where the sweet orange seems to thrive.

Several varieties of the lime are cultivated in the United States. The more important of these are the Mexican, which has a small and rather oblong fruit; the Persian, introduced from Persia, which bears a larger fruit; the Rangpur, introduced from India, which bears a fruit resembling the mandarine orange in that the rind is easily separable from the pulp and the carpels may be separated as in the orange. The most highly prized variety is the Tahiti, the fruit of which is quite large and nearly seedless.

In tropical countries limes are more highly prized than lemons for making cooling drinks. They are also used extensively for the manufacture of lime juice and citric acid. The lime is used as a flavor at soda fountains, and is also used to make a drink called limeade.

The juice of the lime is quite extensively used as a preventive of and as a remedy for scurvy. British sailors are sometimes called "lime-juicers," from the fact that "the law requires that the crews be furnished with a weekly allowance of the extract of limes or lemons, as a preventive of scurvy."

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GRAPE FRUIT

The Grape Fruit is a species of the genus Citrus, which also includes the orange, lemon, lime, and citron. Accounts vary regarding its origin, but it is generally supposed to be a native of the islands on the southern coast of Asia.

The grape fruit is really a monstrous orange. The fruit is from four to eight inches in diameter, and, while in China and Japan its sweet taste has given it the name of sweet ball, as a rule the pulp and juice are sub-acid, or bitter, but withal quite refreshing.

The grape fruit, like all forms of extra development, is more showy than useful. It flourishes in tropical and in sub-tropical countries which are not liable to frost, being far more sensitive to cold than is the orange. Florida seems peculiarly well adapted to the cultivation of this fruit, as well as the varieties used for ornamental purposes only. The tree is a beautiful evergreen with dark shining leaves, against which the clusters of greenish-yellow fruit, which are found on the tree in various stages of development at all seasons of the year, produce a most pleasing and ornamental effect.

The grape fruit trees attain a height of from fifteen to twenty-five feet. The heads of the trees are spreading and the branches armed with prickles. The leaves are somewhat downy underneath and the winged petiols are nearly as broad as the leaves. The white flowers have five petals and five sepals, and the fruit, which is a berry, may attain a weight of fourteen pounds.

The term grape fruit is derived from the fact that the fruit grows in clusters of from three to fifteen, thereby suggesting clusters of grapes.

The trees of the grape fruit are not as liable to disease as are the orange trees. Insects and scales do not attack them to any material extent, and this immunity, together with the advantage of being able to raise the trees from seeds, has tended to the development of many varieties, some of which are of great commercial value.

C. S. Raddin.

THE KUMQUAT

The Kumquat, which is esteemed by many persons a great delicacy, is the fruit of a low bush. It is a native of Cochin-China or China and is extensively cultivated in Japan, California, and Florida. The smooth, angular branches bear a dense foliage of dark green leaves. It is a dwarf member of the citrus group, rarely growing to a height of over eight feet, and is closely related to the orange, the lemon, and the lime. The tree or bush varies greatly in size, but, whether large or small, it will produce a plentiful supply of fruits. As an ornamental pot plant for house decoration it is a beautiful evergreen, blooming freely during the spring and early summer. The flowers, which are like those of the orange tree, are small, sweet-scented, white, and either clustered or solitary in the axils of the leaves. The fruits are orange colored and in form either ovate, oblong, or spherical. The transverse section of the fruit very closely resembles that of the orange and shows either five or six cells and quite large seeds. The pulp is

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QUINCE.

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sour and slightly bitter, while the rind is sweet and somewhat aromatic. Both rind and pulp are eaten and the combination of flavor and taste are greatly admired by many persons.

Two varieties of kumquats are grown in the United States; the Marumi, or round kumquats, and the Nagami, or the oval or oblong forms. The trees that bear the round variety are slightly thorny and the fruits vary from about three-fourths to one and one-quarter inches in diameter. The oval or oblong forms are borne by trees without thorns and have a diameter of from three-fourths to one inch and a length varying from one and one-fourth to two inches. These are more highly esteemed than are the round fruits.

Though eaten while fresh, this fruit is extensively used in making a preserve and marmalade. It is also candied, and is used as a flavor in confectionery.

THE QUINCE

The Quince is the pear-like fruit of a bush or small tree resembling the pear tree. The branches are spreading and of a grayish-green or brownish-green color. The leaves are simple, entire, ovate, with short petioles and distinct stipules. The lower surface of leaves and stipules, as well as the young twigs and the sepals, are densely covered with hair cells, producing a woolly appearance. The flowers develop in May and June and are usually solitary upon terminal branches. Calyx green, with five foliaceous, serrate, reflexed lobes. Corolla of five separate ovate, rather large pink petals. Stamens yellow, numerous (twenty);

five styles and a five-celled ovary. The matured fruit is a pome; that is, the greater bulk consists of the thickened calyx enclosing the ovary. The form, size, and color of the ripe fruit are shown in the illustration. Each cell of the ovary bears from six to fifteen seeds, which resemble apple seeds very closely as to form and color.

On account of its astringency it has been used in dysentery, hemorrhage, and other conditions requiring an astringent substance. At present it is little used, the seeds excepted.

The pulp is fibrous and tough; it is not edible in the raw state on account of its acrid, astringent taste. As a whole, it is a discouraging and disagreeable fruit, in spite of its beautiful yellow color and pleasantly aromatic odor. Mixed with apples, it makes excellent pies and tarts. A marmalade is made from the pulp; also a delicious jelly.

The seeds are extensively used, on account of the mucilage of the outer surface. A decoction commonly known as mucilage of quince seed is much used as a demulcent in certain diseases — in erysipelas, inflammatory conditions of the eyes, and in other affections where mucilaginous applications are found useful. Most of the quince seed of the market comes from southern Russia, southern France, and the Cape of Good Hope. It is cultivated in various temperate and sub-tropical countries.

Description of plate: A, flowering twig; B, fruit; 1, stipules; 2, flower in section; 3, stamen; 4, pollen; 5, style; 6, stigma; 7 and 8, fruit in sections; 9 and 10, seeds of one cell of the ovary; 11, seeds; 12, seed in sections.

ALBERT SCHNEIDER.

LOANED BY LOUIS G. KUNZE, CHICAGO

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STRAWBERRIES
(Fragaria chiloensis).
½ Life-size

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STRAWBERRY

Strawberries are small, herbaceous plants belonging to the Rose family. They are perennial, propagating by means of runners. The white flowers have the general characteristics of the apple blossom and the rose; that is, five (double) sepals and five petals, with numerous stamens and pistils.

The word strawberry is both perplexing and scientifically incorrect. The edible part is not a "berry," but the much-enlarged fleshy torus, or receptacle, to which the numerous very small, rather hard fruits (seeds) are attached. It is botanically a "false fruit," and not a berry at all. The green, ten-parted, star-shaped, leafy structure found attached to the base of the so-called berry is the permanent calyx, which is removed before the fruit is eaten.

About six or seven species are natives of the United States, where they grow wild in prairie lands, as well as in the wooded areas.

The numerous culture varieties are derived from a comparatively few of the fifteen wild stock species. The desirable qualities are sweetness, delicacy of flavor, good size, small seeds, and pulpiness.

Strawberries, for successful cultivation, require rich soil in a protected place. They do not yield a full crop until the second summer after transplanting.

Growers must keep in mind the fact that certain plants produce essentially pistillate flowers and others essentially staminate flowers. Staminate plants are not productive, but

are essential in pollination. The yield of berries varies greatly with soil, climate, cultivation, and variety. Under favorable conditions the yield may be over two hundred bushels per acre. A. SCHNEIDER.

THE CHERRY

The Cherry-trees belong to the Rose family and are thus botanically related to the apple, rose, pear, and strawberry.

Cherry trees are cultivated throughout all civilized countries. As with most other long-cultivated fruits, the various varieties are the product of crossing (cross-pollination), artificial selection, and cultivation, and desirable plants are perpetuated by grafting. There are various wild-growing species of cherry, which must not be confused with the cultivated varieties. The wild black cherry is very common in our woods.

The fruit of the cultivated domestic cherry is the most desirable and is usually had in mind when cherries are mentioned.

Cherry wine is made from the fleshy pulp, which has an excellent quality and flavor. Cherry syrup is the product of fermentation and filtration, with the addition of sugar, and is used as a flavor for cold drinks and added to medicines to improve their efficiency and disguise taste. By crushing and distilling the seeds cherry water is obtained. The flowers and fruit stems are employed in kidney and catarrhal troubles. Cherries may be preserved by drying or pickling. The fruits are also macerated in whisky and

CHERRIES.
(Prunus cerasus).
⅔ Life-size.

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ENGLISH GRAPES.
⅔ Life-size.

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brandy, adding to these drinks an agreeable flavor and acidity. For this purpose the fruit of the wild black cherry is very extensively used. The bark, particularly of the wild black cherry, is extensively employed in medicine. It is a very popular household remedy for the treatment of coughs and colds in children. The gum which exudes from the incised or otherwise injured bark is also used medicinally.

Cherry wood is hard and takes a good polish. It is used in cabinet making, interior finish, and for inlaid work.

Cherries are also employed by the confectioner and by the baker in making pies. The seeds (kernels, pits) are first removed. The habit of swallowing the pits is a dangerous one, as serious and even fatal troubles are caused by them.

A. SCHNEIDER.

THE GRAPE

The name Grape is from the French *grappe,* a bunch of grapes; from the same root as *gripe* or *grab,* to grasp. It is one of the most valuable fruits, not only because of its use in the manufacture of wine, and is the source also from which brandy, vinegar, and tartaric acid are obtained, but because, both in a fresh and dried state, it forms not a mere article of luxury, but a great part of the food of the inhabitants of some countries.

The cultivation of the vine was introduced into England by the Romans, and of late years its cultivation has much increased in gardens, on the walls of suburban villas and of cottages, but chiefly for the sake of the fresh fruit, although wine is also made in small quantities for domestic use.

The cultivation of the vine varies much in different countries. In the vineries of Britain the vines are carefully trained in various ways so as most completely to cover the walls and trellises and to turn the whole available space to the utmost account. The luxuriant growth of the plant renders the frequent application of the pruning-knife necessary during the summer. The bunches of grapes are generally thinned out with great care, in order that finer fruit may be produced. By such means, and the aid of artificial heat, grapes are produced equal to those of the most favored climates, and the vine attains to a large size and a great age. The famous vine at Hampton Court has a stem more than a foot in circumference, one branch measuring one hundred and fourteen feet in length, and has produced in one season two thousand two hundred bunches of grapes, weighing on an average one pound each, or in all about a ton.

C. C. Marble.

THE TOMATO

The Tomato is an herbaceous plant, belonging to the Nightshade family, the same family to which the potato and tobacco belong. It is a native of South America, but is very extensively cultivated in nearly all countries, excepting the cold northern regions.

Botanically, the fruit is a berry, and before ripening is of a bright green color, changing to red in the red variety and to yellow in the yellow variety. The same plant bears flowers and ripe fruits, so that fruits may be gathered for a considerable period.

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TOMATOES.
(Lycopersicum esculentum.)

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EGG PLANT FRUIT.
(Solanum esculentum).
⅔ Life-size.

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Tomatoes have a peculiar flavor and somewhat acid taste when ripe. The pulp contains many seeds. As with other garden plants, there are numerous culture varieties. Some are no larger than cherries. Some are pear-shaped; others large and flattened at the ends. Some are nearly spherical; others quite irregular. The ripe fruits must be gathered promptly, as they decay very readily and quickly.

At the present time the tomato is very little used medicinally, but is very extensively used as an article of diet. Picked green, they are pickled either alone or mixed with other vegetables. The ripened fruit is prepared in a multitude of ways. Peeled and sliced raw, adding salt, pepper, vinegar and sugar. Boiled in soups, mixed with sauces, baked or fried entire, fried or baked, mashed, mixed with stale bread and seasoned, etc. There is a popular superstition that eating tomatoes to excess cauces cancer. Tomato preserves are highly relished by some. Likewise tomato pies.

The general opinion prevails among scientists, as well as laymen, that the tomato is nourishing and wholesome. It is certainly harmless when ripe, but the green pickled preparations are not nourishing, nor particularly wholesome. The notion that pickles aid digestion is a mistaken one. The spices added may stimulate, but the green-fruit particles are not digestible. A. SCHNEIDER.

EGG PLANT

The Egg Plant, also known as Bringal, Aubergine, Egg-apple, and Mad-apple, is an herbaceous plant belonging to the Night-shade family, therefore kin to the potato

and tomato. It is a tender annual, readily killed by the early frosts. It has rather large, simple, somewhat incised leaves. The fruits are large, egg-shaped, tomato-like in structure, hence berries.

It is quite extensively cultivated in gardens. The seeds are sown in hot beds early in April, but transplanting is not done until about the first of June, when all danger of frost is past. The soil should be very rich and the plants set about three feet apart. Like most transplanted plants, they require shading and watering for a few days. Careful cultivation is required during the entire season. Propping may be necessary to keep the large, heavy fruits from the ground. The Colorado beetle is a very annoying enemy of the growing plants and must be effectually fought to insure a crop.

There are several varieties of egg plant. The purple variety is by long odds the greatest favorite. There are also white and yellow varieties.

Most people consider the properly prepared fruit of the egg plant a delicacy. In some tropical countries it forms an important article of diet. The ripe fruit is prepared for the table by peeling and boiling. After boiling the fruit is sliced, seasoned, and fried until well browned in rolled crackers or bread crusts and a liberal supply of butter. When well prepared it is a very palatable article of diet, but when insufficiently cooked or fried it is indigestible. It does not seem to be prepared in other ways, nor does it seem to have any noteworthy medicinal properties.

A. Schneider.

PINE-APPLE.
½ Life-size.

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THE PINEAPPLE

This tropical fruit is so called from its resemblance in form and appearance to the cones of some species of pine. The *Bromeliaceæ,* to which it belongs, are a small family of endogenous plants, quite closely related to the canna, ginger, and banana families, and differing from them in having nearly regular flowers and six stamens, all perfect. As the Pineapple has become naturalized in parts of Asia and Africa, its American origin has been disputed, but there is little doubt that it is a native of Brazil, and perhaps some of the Antilles, now a part of the domain of the United States. This fruit is a biennial, with the habit of the aloe, but with much thinner leaves. In cultivation it early produces seeds, but in ripening the whole flower cluster undergoes a remarkable change; all parts become enormously enlarged and, when quite ripe, fleshy and very succulent, being pervaded by a saccharine and highly flavored juice. Instead of being a fruit, in the strict botanical sense of the term, it is an aggregation of accessory parts, of which the fruit proper forms but a very small portion.

The first pineapples known in England were sent as a present to Oliver Cromwell; the first cultivated in that country were raised in about 1715, though they were grown in Holland in the preceding century. The successful cultivation of the fruit was early considered one of the highest achievements in horticulture, and the works of a few years ago are tediously elaborate in their instructions; but the matter has been so much simplified that anyone who can

command the proper temperature and moisture may expect success. C. C. MARBLE.

THE POMEGRANATE*

The Pomegranate is tree-like, growing to a height of about fifteen feet and in favorable soil even as high as twenty feet. It is probably native in Persia, though it is found in a wild state in all the countries bordering on the Mediterranean Sea. It is also found in China and Japan, and has been brought by man to all of the civilized parts of the globe, where the climate is of a sufficiently high degree of warmth to permit the ripening of its fruit.

This little tree is frequently cultivated not alone for the beauty of its form, but for the beauty of its flowers, which, under cultivation, become doubled and show an increased and striking splendor in the richness of their color.

The pomegranate belongs to the family of plants called *Lythraceæ*. This family has about three hundred and fifty species, which are widely distributed, but are most abundant in tropical regions, especially in America.

The color of the flowers, which develop on the ends of the younger branches, is a deep and rich scarlet or crimson. Many variations have been produced by growing the plants from seeds, and one of these bears white flowers. The petals are rounded and usually crumpled.

The fruit, which is a berry about the size of an ordinary orange, is, when fresh, usually of a reddish-yellow color, becoming brownish in drying. The rind is thick and leathery and encloses a quantity of pulp which is filled

POMEGRANATE.
(Punica granatum.)
¾ Life-size.

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PERSIMMONS.
Life-size.

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with a refreshing juice that is acid. It is of a pinkish or reddish color, and encloses the numerous angular seeds. Probably the chief value of the plant lies in the use of the fruit as a relish, though the rind of the fruit and the bark of the root are used in medicine.

The bark contains a large amount of tannin, and from it there is also obtained a bright yellow dye, which is used to produce the yellow Levant morocco. In regions without frost the tree is often grown for ornamental purposes.

THE PERSIMMON*

The Persimmon, or Virginian Date Plum, is a North American tree, growing wild in nearly all of the southern United States, and will thrive and ripen its fruits as far north as the state of Connecticut and the Great Lakes. It is one of about one hundred and eighty species belonging to the genus *Diospyros*. These are all hardy trees or shrubs. Representatives of the genus are found in nearly all regions that have a tropical or a temperate climate.

Only a few of the species are cultivated. These are highly ornamental trees with a beautiful foliage, which is rarely attacked by insects. The common persimmon of America is the only species that is at all hardy in the north. This and the Japanese species are the only trees that produce the edible fruit commonly found in the market. The wood of nearly all the species of *Diospyros* is hard and close-grained. The trees that yield the beautiful ebony of commerce belong to this genus, and the species that is said to yield the best quality of this wood is a native of the East

Indies and Ceylon. It is also cultivated to some extent in hothouses and in tropical climates.

The common persimmon of the United States is a tree usually growing to a height of about fifty or sixty feet and rarely reaching one hundred feet. This is a beautiful round-topped tree with more or less spreading branches. The name persimmon is of Indian origin and of unknown meaning. The fruit of this species is but lightly appreciated, except by those who visit the forest regions in which it is native, for it is only cultivated to a very limited extent. The fruit is globular in form and quite plum-like. It varies both in size, color and flavor. When green the fruit is astringent and has a very disagreeable taste. This, however, disappears when the fruit becomes fully matured.

THE WATERMELON

The Watermelon is a native of Africa. In fact, Livingston states that in Africa large areas are covered by the plants growing in a wild state, and in New Jersey and Long Island, where large fields are devoted to its cultivation, the plants show a marked tendency to spread spontaneously.

The watermelon belongs to an eminently respectable but not a particularly aristocratic family. Its near relations are the gourd, the cucumber, the pumpkin, and the squash. There is probably no country in which this fruit is so largely cultivated as in the United States, its habitat being limited, however, to the southern and middle portions of North America to the fourth degree of latitude. The short sea-

WATERMELON.
(Citrullus vulgaris).
¼ Life-size.

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Life-size.

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Almond

Filbert

Pecan

sons of the more northern states are unfitted for the complete development of the fruit. It is peculiar in the fact that it yields no important by-products, with the exception that its saccharine matter may be converted into sugar. The juices of the fruit cannot be converted into wine or vinegar, and, unlike the cantaloupe, it does not produce a good brandy when distilled.

The plants are annual, trailing, slender vines extending from eight to fifteen feet. The leaves are five-lobed, from three to six inches in length, and in dry countries the plants often supply vegetation when all others are dried up. The leaves are possessed of an unusual perspiratory power, hence they require a greater amount of moisture than the majority of plants, the roots often extending a considerable distance to reach water. C. S. RADDIN.

NUTS*

1. The English Walnut has a thin shell. This nut is much esteemed and is an important article of commerce. It yields by expression a bland fixed oil, which, under the names of "walnut oil" and "nut oil," is much used by painters and is a common article of food.

2. The Peanut is also called Ground Nut and Earth Nut. It is cultivated in all warm regions of the globe, and its usefulness is such that it is likely to extend.

3. The Brazil Nut is a popular nutritious nut grown in Brazil. The large outer shell is filled with nuts, making a most peculiar fruit. The shell is very hard and contains a rich, oily meat in one piece like an almond.

4. The Hickory Nut abounds near the Great Lakes and in some parts of New Jersey and Pennsylvania. The nuts are in considerable demand and are sometimes exported. The shell is thin but hard and the kernel sweet.

5. The Filbert is the fruit of the hazel. The kernel has a mild, farinaceous, oily taste agreeable to the palate. In England filberts are usually large hazel nuts. The American hazel nuts are of two other species.

6. The Chestnut is eaten raw, boiled, or roasted, or is ground into meal, and puddings, cakes, and bread are made from it. The tree is common to Europe and America.

7. The Pecan, sometimes called the Illinois Nut, a species of hickory nut. The shell is thin and the meat well flavored. The tree grows in North America, chiefly in the Mississippi Valley, and in Texas, where it is one of the largest of forest trees.

8. The Almond grows on a tree about twenty or thirty feet high, a native of the East and of Africa, but has now become completely wild in the whole south of Europe.

THE ENGLISH WALNUT AND RELATED TREES

The English Walnut, Butternut, Black Walnut, Shagbark or Shellbark Hickory, Mockernut or Whiteheart Hickory, Bitternut Hickory, and Pignut Hickory are closely related, belonging to the Butternut family. They are large, handsome trees with spreading branches and clean-cut leaves. They are of comparatively slow growth, but hardy and enduring. The English walnut is a tall, large, handsome tree which undoubtedly came from India.

FROM KŒHLER'S MEDICINAL-PFLANZEN.

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ENGLISH WALNUT.
(Juglans regia.)

CHICAGO:
A. W. MUMFORD, PUBLISHER.

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All the other members of the Butternut family are common throughout the United States, either growing wild or under cultivation. The wood of the butternut or white walnut and that of the black walnut is extensively used in cabinet making, furniture making, and interior finish, particularly the wood of the black walnut. The earlier craze for black walnut furniture threatened to exterminate the plant, but, fortunately (for the walnut tree), the fashion is waning. The wood is heavy, dark brown in color, of medium hardness, easily worked, and readily polished, though it does not take the glossy polish of the harder woods, as ebony. Hickory wood is very hard, tough, and durable, but it is not suitable for cabinet making, etc., because it warps too much. It is an excellent wood for making handles for tools of all descriptions, oxen yokes, hoops, walking-sticks, whiffletrees, wagon stocks, etc. Its tensile strength is enormous, being said to be equal to that of wrought iron.

The seeds (kernels) of the English walnut, butternut, black walnut, and shagbark hickory are edible and greatly relished, while those of the bitter and pignut hickories are not edible. Eating too many of the kernels causes distressing dyspeptic symptoms because of the large amount of oil which they contain. Salting the kernels before eating or taking a little salt with them is said to lessen these disturbances.

Description of plate: A, twig with staminate and pistillate flowers; B, twig with pistillate flowers; C, fruit; 1-6, flowers and floral parts; 7-10, fruit and seed (nut)

A. SCHNEIDER.

THE ALMOND

The Almond is the fruit of a small tree belonging to the Rose family. The plant is believed to be a native of northern Africa, Persia, and Turkestan. It occurs wild in Sicily and Greece and is cultivated throughout temperate Europe, including England.

The leaves of the almond tree are simple, broadly lanceolate, margins serrate, bright green, and stalked. The flowers are nearly sessile, mostly solitary, petals bright pink; otherwise similar to the flowers of the rose family as seen in the apple blossom, cherry blossom, and the wild rose. The fruit is a drupe or stone fruit, resembling the peach in its general structural characters. It is, however, much smaller, measuring about one and one-half inch in length. As in the peach, the outer portion of the fruit coat is fleshy, the inner portion is hard and encloses the kernel or seed to which the term almond usually is applied. The plant is very ornamental, producing its beautiful flowers in March, before the leaves are developed.

Two natural varieties of almonds are quite universally recognized — the sweet and the bitter. They resemble each other so closely in general appearance that it is practically impossible to distinguish between them. The principal difference lies in the chemistry of the kernels or seeds themselves. In the bitter variety amygdalin is found, which is practically wanting in the sweet variety.

At the present time the sweet almond is extensively cultivated in northern Africa, southern Europe, and in the

ALMOND.

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A. Flowering branch. B. Fruiting branch. 1. Longitudinal sections of flower. 2. Petals. 3. Stamens. 4. Pollen. 5. Pistil. 6. Longitudinal view of ovary. 7. Cross section of same. 8. Nut. 9. Longitudinal section of same. 10 Almond meat. 11-12. Sectional views of same.

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232 Butter-nut.
Edible Pine.
Cross section Black Walnut.

EDIBLE NUTS.

Cocoa Nut.

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Butter-nut in husk.
Black Walnut.

warmer parts of the United States, particularly in California. Climatic conditions and cultivation has a great influence upon the quality of the almonds, and we have as a result quite a number of commercial varieties, just as we have commercial varieties of coffee, tea, oranges, etc. The more important commercial varieties are the Jordan, Valencia, Barbary, and California almonds.

Description of plate: A, B, branch with flowers and fruit; 1, 1a, flowers from different trees; 2, 2a, petals; 3, stamens; 4, pollen; 5, stamen; 6, 7, ovary; 8, 9, seed with shell; 10, seed without shell; 11, 12, sections of seed.

A. SCHNEIDER.

THE COCOANUT*

The fruit of the Cocoanut Palm, which is the most useful tree of all its tribe to the natives of the regions in which it grows, is one of the most valuable and important of commercial products. On the Malabar and Corvomandel coasts of India the trees grow in vast numbers; and in Ceylon, which is peculiarly well situated for their cultivation, it is estimated that twenty millions of the trees flourish. The wealth of a native of Ceylon is estimated by his property in cocoanut trees, and Sir Emerson Tennent notes a law case in a district court in which the subject in dispute was a claim of the twenty-fifth twentieth part of an acre of palms. The tree is very beautiful and lofty, growing to a height of from sixty to one hundred feet, with a cylindrical stem which attains a thickness of two feet. It terminates in a crown of graceful leaves. The leaf sometimes attains a length of

twenty feet, consists of a strong midrib, whence numerous long, acute leafllets spring, giving the whole, as one traveler described it, the appearance of a gigantic feather. The fruit consists of a thick external husk or rind of a fibrous structure, within which is the ordinary cocoanut of commerce. The nut has a very hard, woody shell, inclosing the kernel, within which again is a milky substance of a rather agreeable taste.

The cocoanut palm is so widely disseminated throughout tropical countries that it is impossible to distinguish its original habitat. It flourishes with equal vigor on the coast of the East Indies, throughout the tropical islands of the Pacific, and in the West Indies and tropical America. It is most at home, however, in the numerous small islands of the Pacific Ocean.

COCOA

The Cocoa-yielding plant is a tree varying from fifteen to forty feet in height. The main stem or trunk is much twisted and knotty, from which the branches stand out almost horizontally. The bark is thick, rough, and of a cinnamon-brown color.

The chocolate tree is a native of Mexico, Central America, Brazil, and other South American countries. It is now extensively cultivated in most tropical countries of both hemispheres. The West Indian islands have numerous large plantations. It is also found in botanic gardens and greenhouses. There are several cultivated varieties.

The cocoa or cacao-yielding plant must not be confounded with the cocoanut palm or the coca-yielding plant.

COCOA FRUIT.

A. W. MUMFORD, PUBLISHER, CHICAGO

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There is perhaps no food substance which is more universally liked than chocolate. Mothers have no small amount of trouble in hiding the household chocolate from the children. With the omnipresent penny-in-the-slot machine, more pennies are credited to it than to the chewing gum. The housewife and baker use it very extensively with chocolate cake. The confectioner uses it very freely, to the great delight of the children.

The principal use to which cocoa is put is in the preparation of a beverage. For this purpose, enormous quantities of chocolate, cocoa broma, and hulls are consumed annually. The drink is prepared by thoroughly triturating the desired amount of chocolate, cocoa, or broma with a small quantity of water, then stirring this into the necessary quantity of boiling milk or water, and boiling for a few minutes, with constant stirring. The oil present gives the drink great nutritive value.

Cocoa butter, which resembles tallow in consistency and appearance, is used in medical and pharmaceutical practice as a salve or pomade for external application in eruptive diseases, as scarlet fever, etc. Cocoa also finds extensive use in medical practice, though it has no marked curative properties.

Description of plate: Fruit and seeds: B, pericarp; 11, showing how seeds are contained in pericarp; 12, cross section of pericarp; 13, 14, 15, 16, 17, seeds.

ALBERT SCHNEIDER.

CORN

Maize, or Indian Corn, also known as Corn, is a plant belonging to the grass family. It usually attains a height of about seven feet, the single unbranched stem being jointed, only slightly tapering, with a central pith and an outer hard tissue to give necessary resistance to heavy winds. Each node (joint) has a single long, sword-like leaf, the lower portion of which encloses the stem (internode) like a sheath. The fruit, known as the "ear," is collective, several hundred individual fruits, usually designated as "kernels," being fastened to the spike, commonly known as the "cob."

At the present time, corn is extensively cultivated in various countries, but nowhere on such an enormous scale as in the Mississippi Valley. The Mississippi corn region, with Springfield, Illinois, as its center, produces annually from 10,000 to 15,000 millions of bushels, or about three-fourths of the total crop of the United States. In the Central States corn is cultivated on a large and simple scale, made possible by the rich soil. One man with four horses cultivates from eighty to one hundred acres, besides oats and other farm products. Corn requires rich, black, loose soil, with good surface drainage, and special climatic conditions. The season must be warm and nights must not be cool.

With perhaps the one exception of rice, maize is the most extensively used grain in the world. In fact, all parts of the plant are used. The leaves form an excellent fodder for horses and cattle. The stalks also are used in paper making

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and in fertilizing the soil. The husk is used in mattresses. The most valuable part of the corn is the fruit, generally spoken of as the grain, or kernel. Green corn is highly relished as an article of diet, although its food value is certainly overestimated, as it is hard to digest. For this purpose sweet corn is preferred. A. SCHNEIDER.

WHEAT

The classification of the different varieties of cultivated Wheat has occupied the attention of many botanists and agriculturists. A good selection of seed, according to the nature of the soil, demands intelligence and accurate knowledge on the part of the farmer. If a good variety be grown in poor soil, the result will be unprofitable, while if bad wheat is grown on good soil, the result may be nil. In botanical collections there exist, it is stated, herbarium specimens or other evidences of plants grown in Norway as far north as latitude 65 degrees, in Switzerland at an elevation of 1,200 feet above the Valley of Zermatt (or 6,500 feet above the sea), near the Straits of Magellan, as well as in Teneriffe, the Cape of Good Hope, Abyssinia, Rodriguez, the Philippine Islands, and the Malay Archipelago. These widely separated localities show the great area over which the culture is possible, and illustrate the powers of adaptation of the plant. The requirements of the consumer also have to be considered; for some purposes the soft wheats, with their relatively large proportion of starch, are the best; for others, the hard wheats, with their larger quantity of gluten. With the modern processes of milling, the hard

wheats are preferred, for they make the best flour; and in North America the spring wheats are harder than the winter wheats. The soft wheats are those which are most general in European cultivation, and, as a rule, the beardless varieties, though more tender, are preferred. The bearded varieties are supposed to be hardier; at any rate, they defy the ravages of predatory birds more completely than the unarmed varieties, and they are preferable in countries liable to storms of wind, as less likely to have their seeds detached. Hard wheats are specially employed in Italy for the fabrication of macaroni. Polish wheat is used for similar purposes. Spelt wheats are grown in the colder mountainous districts of Europe; their flour is very fine, and is used especially for pastry making, but, owing to the construction of the grain, it requires special machinery for grinding.

The numerous varieties of wheat now in cultivation have been obtained either by selection or by cross-breeding. In any wheat field there may be observed, on close inspection, plants differing in character from the majority. If seeds of these "sporting" plants be taken and grown in another season, they may (or may not) reproduce the particular variation. If they do, and the same process of selection be continued, the variation becomes in time "fixed," though it is always more or less liable to revert to its original condition.

The production of wheat, with the use of wheat bread, has increased enormously since the extension of railways has made possible the transportation of grain for great distances by land. Of late years the increase of production has been most notable in southern Russia, Australia, India, and North America.

A. B. E.

CHAPTER VI

MUSHROOMS

THERE are few more useful, more easily recognized, or more delicious members of the vegetable kingdom than the common Mushroom. It grows in short grass in the temperate regions of all parts of the world. Many edible fungi depend upon minute and often obscure botanical characteristics for their determination, and may readily be confounded with worthless or poisonous species, but that is not the case with the common mushroom, for, although several other species of *Agaricus* somewhat closely approach it in form and color, yet the true mushroom, if sound and freshly gathered, may be distinguished from all other fungi with great ease. It almost invariably grows in rich, open, breezy pastures, in places where the grass is kept short by the grazing of horses, herds, and flocks. Although this plant is popularly termed the "meadow mushroom," it never, as a rule, grows in meadows. It never grows in wet, boggy places, never in woods or on or about stumps of trees. An exceptional specimen or an uncommon variety sometimes may be seen in the above-mentioned abnormal places, but the best, the true, and common variety of our tables is the product of short, upland, wind-swept pastures. A true mushroom is never large in size; its cap very seldom exceeds four, at most five, inches in diameter. The large examples, measuring from six to nine or more inches across the cap, belong to *Agaricus*

arvensis, called, from its large size and coarse texture, the Horse Mushroom, which grows in meadows and damp, shady places, and, though generally wholesome, is coarse and sometimes indigestible.

The mushroom usually grown in gardens or hotbeds, in cellars, sheds, etc., is a distinct variety, known as *Agaricus hortensis.* This is a compact and inferior form of the true mushroom, or it may indeed be a hybrid or even a distinct species.

The parts of a mushroom consist chiefly of stem and cap; the stem is furnished with a clothy ring around its middle, and the cap is furnished underneath with numerous radiating colored gills. When a mushroom is perfectly ripe and the gills are brown-black in color, they throw down a thick, dusty deposit of fine brown-black or purple spores; it is essential to note the color. The spores, on germination, make a white felted mat, more or less dense, of mycelium; this, when compacted with dry, half-decomposed dung, is the mushroom spawn of gardeners. The stem is firm, slightly pithy up the middle, but never hollow; it is furnished with a floccose ring near its middle; this ring originates by the rupture of the thin general wrapper of the infant plant. On being cut or broken, the flesh of the true mushroom remains white or nearly so, the flesh of the coarser horse mushroom changes to buff or sometimes to dark brown. To summarize the characteristics of a true mushroom: It grows only in pastures; it is small in size, dry, and with unchangeable flesh; the cap has a frill; the gills are free from the stem; the spores brown-black or deep purple-black in color, and the stem solid or slightly

CHANTARELLE (Edible).
(Cantharellus cibarius).

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pithy. When all these characteristics are taken together, no other mushroom-like fungus can be confounded with it.

A. B. E.

THE CHANTARELLE

The Chantarelle is a well-known and rather common mushroom which grows quite abundantly in woods of spruce and fir, and in wet seasons also in the forests of deciduous trees. Here it may be found growing either in clusters or singly, from June to November. The cap is usually about two to three inches in diameter, but may reach an extreme of five inches; when young, it is rounded or flat on top, but as it grows older it becomes more or less concave and occasionally folded on itself. The plant as a whole has a uniform yellow color, "suggesting the yolk of an egg," and is smooth. The gills are more like veins than are the parallel knife-like projections hanging like "thin laminated curtains" from the undersides of the caps of many of our more familiar mushrooms. In chantarelles they appear like "turgid veins" rather than gills, for they are irregularly branched and extend downward on the stem in an uneven manner. The stem is solid. The flesh is white and firm and has often afforded an agreeable addition to a camp menu of those who enjoy outings in the coniferous woods of Maine, where it grows in great profusion.

The taste of this mushroom when raw is "pungent and peppery," an unpleasant characteristic which disappears when it is cooked. By many, the chantarelle is considered the most delicate and appetizing of all edible fungi.

Elizabeth W. Woodworth.

THE GLISTENING COPRINUS

From April to November, though more commonly in spring and autumn, the Coprinus appear, and it is not an uncommon occurrence when a single stump will yield several crops in a season. Sometimes the group of mushrooms seems to grow directly from the earth and are apparently far from decaying wood. However, there is probably a piece of wood hidden beneath the surface of the ground, upon which this dependent plant is being nourished.

The clusters of the Glistening Coprinus are frequently very large, and contain a number of individual plants. Thus, though the plant itself is small, the whole cluster will furnish quite a harvest. In Europe this mushroom is not included among the edible forms. Dr. Peck suggests that this may be due to its small size, but the abundance and ease with which it may be procured compensate for its lack of size. By those who have eaten it repeatedly without harm it is considered a delicacy, and not inferior to many other species. When raw it has a flavor of nuts.

The genus *Coprinus,* to which the mushroom of our illustration belongs, includes a number of species which are commonly called Ink Caps. All are easily identified, for soon after the spores have matured the plates that bear them are resolved into an inky fluid, especially in damp or wet weather. Their life histories are nearly completed while still beneath the surface of the ground. It is only when their spores are quite mature that they seek the air above the surface, pushing themselves out in the night time, only

GLISTENING COPRINUS.
(Coprinus micaceus).

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FROM COL. CHI. ACAD. SCIENCES.

MASKED TRICHOLOMA.
(Tricholoma personatum).

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to melt away in inky drops during the day. Sometimes when the weather is not damp all the parts may dry and the mushroom remain well preserved.

It is only when young that the glistening coprinus should be gathered for food, and the specimens should be cooked immediately, for they are far from attractive when they have turned black. ELIZABETH W. WOODWORTH.

THE MASKED TRICHOLOMA

The Tricholoma of our illustration is one of the well-known edible mushrooms. Many authors of writings on the food mushrooms speak highly of its esculent qualities. Its taste is pleasant and its flavor may be likened to that of veal. The Masked Tricholoma is generally found in rather open woods or on open, grassy places in the woods. It is a fall species, seldom appearing before the first of September, and it is then common, in favorable places, until the time of heavy frosts.

In England the masked tricholoma is often called Blewits, and Dr. Peck tells us that it is called Blue Stem in France, although in our own country the plant has a more violet or lilac than a blue color. Its solid stem is short and stout and not infrequently bulbous at the base. In color the stem is whitish, tinged with lilac or violet, and when young there are fibrils on its surface which quite disappear as the mushroom grows older. Usually the masked tricholoma is solitary in its growth, but it is also found in groups or even in clusters of several individuals. When young the cap is convex and quite firm, but as it grows older it becomes flat

and flabby, and the margins may become wavy. The margin of the caps of miniature plants is incurved and not infrequently covered with whitish particles or with a fine bloom. The cap varies in color, but is generally some shade of tan, gradually changing into a pale lilac near the edge.

ELIZABETH W. WOODWORTH.

THE GREEN RUSSULA MUSHROOM

Mushrooms are plants. They occupy a unique position, however, in the vegetable kingdom. It might be said of these "children of earth" that they toil not, neither do they spin, inasmuch as they take no part in the busy life of the plant world. They must depend for their sustenance on the efforts of other plants. They develop no flowers or seeds, but reproduce by means of spores, which germinate if the peculiar conditions essential to their growth are present.

Our illustration shows an edible form of mushroom whose beautiful colors contradict a prevailing idea that the highly colored forms are poisonous. The plant is known as the Greenish Russula. It can hardly be called green; greenish-gray better describes it. The top is dry and has upon it small warts or patches of the characteristic color. It is at first rounded, then flat, and later may become centrally depressed. It is usually thin and smooth at the edge, marked there with short lines following the direction of the gills. Old specimens will occasionally split at intervals along the edge. The gills are white or nearly so, and are very fragile, being shattered by a slight blow. They are

FROM PAINTING BY A. WOODWORTH.

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GREEN RUSSULA (Edible).
(Russula virescens).

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FLY MUSHROOM (Poisonous).
(Amanita muscaria).

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narrow near the stem, hardly reaching it. The flesh is firm and of a creamy-white, the spores being white. The stem is thick, solid, and rather short.

It is not surprising that forms exhibiting such a variety of color and form and mystery of development should have become a subject for myth and story.

Mushrooms are responsible for the fairy rings so often noticed in pastures. They were thought to be formed by the dancing feet of the fairies, but science comes along and replaces the fancy by cold facts.

A mushroom soon exhausts from the soil the food necessary for its growth. Hence its spores must fall beyond this depleted area in order to germinate, and by so doing a ring of toadstools is formed. When they decay the ground becomes fertilized, causing the grass to spring up along the line of the ring with greater luxuriance than elsewhere.

C. S. Raddin.

THE FLY MUSHROOM OR FLY AMANITA

The Fly Mushroom is one of the most dangerous. It grows very abundantly in July, August, and early September. It is attractive in appearance and gorgeous in coloring, but its fair exterior is a snare and delusion. To it and its blood relatives probably may be attributed most, if not all, of the deaths from mushroom poisoning. It is commonly conceded that its family is the only one which is fatally poisonous, although there are others which produce unpleasant illness. This particular member of the family is mentioned because it is very common.

In examining this mushroom, one should not pull it; dig it up carefully and be sure to lift all of it. When matured it will weigh perhaps half a pound. It is usually of an orange-yellow, fading to a pale color at the edge. Sometimes it may be pale yellow, again almost white. You will notice a number of raised, irregular whitish or yellowish spots or patches on the surface at the top. These are characteristic. The top is nearly flat in mature specimens, and sometimes measures eight or ten inches in diameter. If the baby growth is examined it will be noticed that it is almost globular. The gills are white and very regular, and are sometimes slightly tinged with yellow. On the stem there is a sort of ring or collar which is whitish or yellowish in color and of a thin texture. The lower part of the hollow or stuffed stem swells out and is distinctly bulbous at the bottom, and about the base there is a sort of cup or socket from which the stem rises. Above it, the stem is clothed with whitish or yellowish fragments of like texture to the ring. Sometimes these fragments are almost woolly and extend upwards for some distance.

The flesh of this mushroom is white, firm, and very inviting. The gills are rounded at the edge and at the stem. The odor is pleasant and the spores are snowy-white. Altogether, there is nothing to warn the rash experimenter that it is not as good as it looks. You will find these decorative mushrooms in field as well as in woods; long ranks of them file away through the thin grass. Also one may see them standing in all their glowing color in evergreen woods, the fatal poison cup hidden by the deep green moss.

ELIZABETH W. WOODWORTH.

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POLYSTICTUS.
(Polystictus cinnabarinus).
⅛ Life-size.

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THE CINNABAR FUNGUS*

The fungus which we illustrate is not uncommon on decaying portions of oak, basswood, cherry, and other trees of the woods of many localities. It was given its specific name because of its brilliant cinnabar color, by which it may be recognized at quite a distance. Dr. W. S. Moffatt says that over one hundred specimens were found growing on a log in the woods not far from Chicago.

This species belongs to a large and interesting group of the fungi family. *Polyporaceæ* include fleshy, leathery, or woody forms. Dr. Charles McIlvaine says: "Within this large family are found edible species. In the woody species the razor-strop man finds material for his strops; the surgeon, styptics; the peasant, punk to catch sparks from his flint, and the Fourth of July urchin, a fire-holder to light his pyrotechnics. The Chinese have placed some species in their fathomless materia medica, while the polyporus of the locust tree is used in America as a medicine for horses. No fungoid growth is more universal. They are the ever-active preservers of our trees and converters of forest debris." The species illustrated is leathery, and no edible species of its genus have been reported.

THE BRACKET FUNGI

The plants known as Bracket or Shelf Fungi are familiar objects to every lover of nature who frequents our groves and forests. Beginning as small, slightly elevated protu-

berances, or flat, orbicular patches on the bark of a dead tree trunk, log, or stump, they gradually increase in size and assume more or less definite shapes. Some never attain a breadth of more than a third of an inch, while others may ultimately obtain a width of nearly a foot and one-half, and project fully one-half that distance from the surface of the matrix. The most common form, perhaps, is that of a semicircle, the fungus being more or less flattened and attached by its straight edge to the log or stump.

Sometimes the edges are upraised so as to form cup-shaped growths. Several kinds are so thickened that they nearly resemble a horse's hoof in form, while a few others, although classed as "brackets," are merely amorphous masses appearing in a knot hole or wounded place in a log or stump.

The fungus which we illustrate occurs on the trunks of various trees in Canada, the United States, and in Mexico. The plants grow in tufts or clumps. The pilei or receptacles are leathery and thin. At first they are plain; later they are often recurved at the edges. They are villous, with brown, shining zones, and the bases are narrowed and substipitate. The hymenium or fruit-bearing surface of each plant has a pallid brick color, sometimes with reddish or lilac tints. The specimens figured are proliferous; that is, new pilei arise from the edges of those of the preceding season.

WILL SAYER MOFFATT.

ROM COL. DR. W. S. MOFFATT

A BRACKET FUNGUS

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SULPHURY POLYPORUS.
(Polyporus sulphureus).
½ Life-size

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THE SULPHURY POLYPORUS*

This attractive mushroom may be easily known by its bright colors and its clustered mode of growth. Our illustration is a faithful reproduction of beautiful specimens of the Sulphury Polyporus which grew on a living black oak tree about fifteen feet from the ground. Though the habit of this mushroom is to grow only on dead wood, the host of the two illustrated was seemingly sound throughout.

When young, if cut or broken in warm weather, a yellowish juice will exude. The caps overlap each other and are frequently five inches or more in width. The flesh is white and usually not more than one-half an inch in thickness.

The young cap has a yellowish-red or light orange color which fades, as growth continues, to a beautiful yellow color, especially on the margins. A large cluster of the caps of this mushroom with the bright colors and wavy margins form a beautiful picture on the dark background of a stump, a log, or a tree. It is not particular about the kind of wood on which it grows. The dead wood of almost any species of trees may serve as its host, and not infrequently it will grow upon those in an orchard.

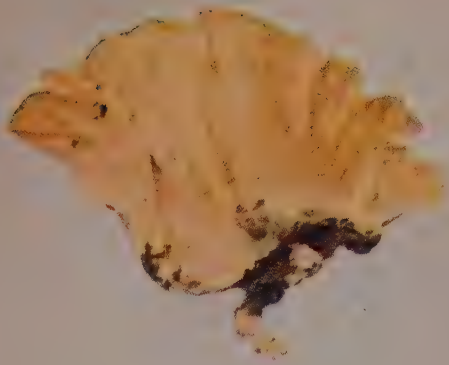
The sulphury polyporus is an excellent illustration of the fallacy of the belief that the highly colored mushrooms are all poisonous. It is not only edible, but palatable as well. However, only the young caps should be used as food, for mature specimens are not only tough, but very indigestible, and unpleasant to the taste. Thinly slicing the young caps

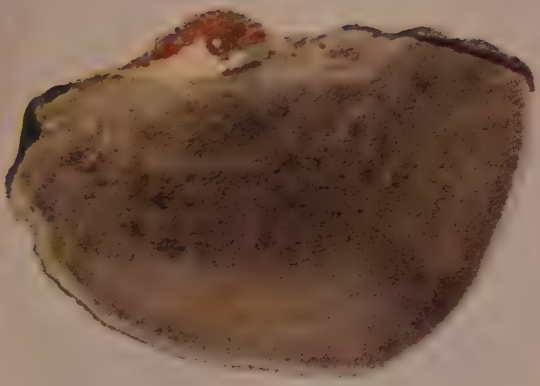
and frying them in butter is perhaps the most satisfactory method of preparing this mushroom for the table, though it may be prepared in other ways. This species has a wide distribution. It may be found in the forests or in the orchards; on the dead wood of trees, on the lawn, or anywhere where conditions are favorable for its growth. Though it may be found from May to November, it is more common and grows more luxuriantly in wet weather.

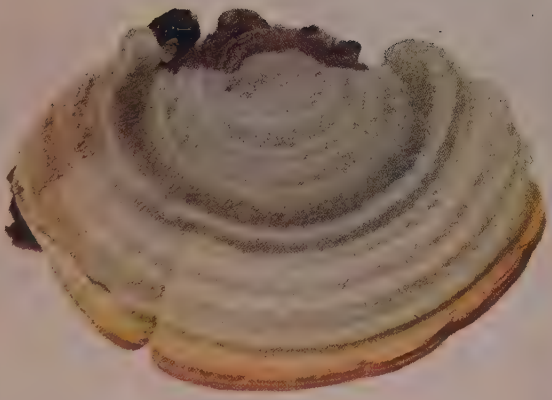
WOODY FUNGI

Among the common fungi which attract a pedestrian during his rambles through a forest, there is one group which has been given the name *Polystictus* by the scientist. This is a genus of bracket-like species which are leathery, woody, or membranous from the very beginning of their growth. They are pore-fungi; that is, the fruiting spores are borne on the inner faces of tubes or pores which form a single layer on the underside of the bracket. These tubes usually appear first near the center of the bracket and gradually develop toward its circumference.

A shell-shaped form occurs on dead twigs and small branches, both of standing and fallen trees of various kinds, especially of walnut and elm. The plants are small, thin, smooth, white, and of a spongy-leathery texture. At the first, they resemble very small shallow cups seated on the surface of the bark. As they increase in size, their shape becomes more or less spiral, the color pallid, and the surface marked by several consecutive furrows. The under surface is yellowish, afterward changing to gray. It is a pretty and







FROM COL. DR. W. S. MOFFATT.

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WOODY FUNGI.

Upper side.
Lower side.

Common Zoned Polystictus.
(Polystictus versicolor).

Bristly Polystictus.
(Polystictus hirsutus.

Lower side.
Under side.

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delicate little species, which is less than an inch in diameter when fully grown.

A parchment-like species is common on tree trunks of all kinds, particularly those of oaks, hickories, and poplars. The plants are thin, leathery, membranous, rigid, hairy, concentrically grooved, and white in color. The fruiting pores are at first a rich violet or purple color, but this color fades with age or upon exposure to sunlight, so that in old specimens the under surface has a dirty brown color. At first, the plants often grow as a layer, covering the tree trunk for a yard or more. From the surface of this layer the bracket-like growths arise, usually at short intervals from each other, and when fully grown may project an inch or more.

W. S. Moffatt.

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CHAPTER VII

MISCELLANEOUS PLANTS

PLANT PROTECTION

It is supposed by many that plants are helpless beings, which must submit to all sorts of unfavorable conditions which come upon them. This is far from true, for while plants as a rule are fixed and unable to escape from danger by flight, still they have very many ways of helping themselves.

Prominent among the dangers which come to active green plants are those which arise from too intense light, which may destroy the delicate working substances. Since the leaves are the great working organs in the manufacture of food, they are especially equipped for protection. Those leaves which must work in exposed places have many details of structure which are evidently for guarding them against the ill effects of too intense light. The most striking adaptations, however are those which have to do with protective positions. Under ordinary circumstances, leaves are placed so that their flat faces are exposed to the most intense light. In some cases this is so great a danger that the leaves are set edgewise, the edges being directed upwards and downwards. When a plant assumes this habit, the leaves are said to be in a profile position, and the plants are sometimes called "compass plants." The latter name has come from the fact that such leaves usually point north or south, and

once it was assumed that this position was in response to some mysterious magnetic influence. It is found, however, that it is merely an effort on the part of the plant to protect its leaves from the intense light of mid-day, and at the same time to expose them to the morning and evening rays of much less intensity.

Some leaves, however, have the power of shifting their position according to their needs, directing their flat surfaces toward the light, or more or less inclining them, according to the danger. Perhaps the most completely adapted leaves of this kind are those of the "sensitive plants," whose leaves respond to various external influences by changing their positions. The sensitive plants abound in dry and hot regions, and one of the best known is represented in our illustration. It will be noticed that the leaves of this Mimosa are divided into very numerous small leaflets, which stretch in pairs along the leaf branches. When the time of intense light and dryness approaches, some of the pairs of leaflets fold together, slightly reducing the surface exposure. As the unfavorable condition continues, more leaflets fold together, then still others, until finally all the leaflets may be folded together, and the leaves themselves may bend against the stem. It is like a sailing vessel gradually taking in sail as a storm approaches, until finally nothing is exposed, and the vessel weathers the storm by presenting only bare poles. These are but a few illustrations of the very numerous devices for escaping too intense light and the dangers which accompany it.

One common danger in temperate regions comes from the lowering of the temperature each night, which sometimes

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may chill the living substances to the danger point. This is particularly dangerous to seedlings, whose tender structures have not yet developed the ordinary protective coats. In the spring the seed leaves of numerous seedlings may be seen at the approach of night to rise upward and come together, just as the palms of the hand may be placed together over one's head. This reduces the surface of exposure and the danger of chill at least one-half.

Many plants are also observed to protect themselves against rain, as it is necessary for leaves to avoid becoming wet. If the water is allowed to soak in, the work of the leaves is at once interfered with. Hence it will be noticed that most leaves are able to shed water, partly by their position, partly by their structure.

Perhaps the most general preparation for protection in our region is that which is made for the coming of the winter's cold. In many cases plants do not attempt to protect their delicate structures from the severity of winter, but disappear entirely, leaving only well-protected seeds to carry them over into the next growing season. This results in the so-called "annual habit," which has been learned by many plants in order to escape a season of danger. Other plants do not disappear so completely, but everything above the surface of the ground dies, while the plant continues in the form of underground bulbs, tubers, or various thickened structures.

This habit of seeking a subterranean retreat at the approach of some dangerous season is a very good one, and is found in many of our early spring plants. This subterranean habit has a great advantage over the annual habit,

since a seed is very slow in bringing the plant back again, while a bulb can produce its plant very rapidly.

Still other plants preserve more of their structures than either the annuals or the ground-loving plants. For example, most of our trees have cultivated what is known as the deciduous habit, that is, they merely drop their leaves, which are the endangered structures, at the approach of the unfavorable season, and renew them again when the favorable conditions return. It should be remarked that these leaves do not fall because they are broken off, but that in a certain sense it is a process of growing off, which is carefully prepared for.

It is instructive to notice how differently the so-called evergreens, as pines, spruces, etc., have answered the problem of protection against the cold of winter. The evergreens, instead of dropping their leaves, have undertaken to protect them, giving them a small surface and very heavy walls. In this way protection has been secured at the expense of working power during the season of work. Reduced surface and thick walls are both obstacles to leaf work.

To obtain the most striking instances of protection, however, one must examine plants which belong to permanently dry regions, such as may be found in the United States along the Mexican border, or in the regions of tropical deserts. In the first place, it will be noticed that the plants in general produce smaller leaves than in other regions. That this holds a direct relation to the dry conditions is evident from the fact that the same plant often produces smaller leaves in dry conditions than in moist. One of the most

AMERICAN MISTLE-TOE.
½ Life-size.

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striking features of an arid country is the absence of large leaves. These reduced leaves are of various forms, such as the needle leaves of pines, or the thread-like leaves of certain sedges and grasses, or the narrow leaves with inrolled margins, such as are common in many heath plants. The extreme of leaf reduction has been reached by the cactus plants, whose leaves, so far as foliage is concerned, have disappeared entirely, and the leaf work is done by the surface of the globular, cylindrical, or flattened stems. A covering of hairs is an effective sun screen, and it is very common to find plants of dry regions characteristically hairy. In such regions it is to be observed also that dwarf growths prevail, so that the plant, as a whole, does not present such an exposure to the drouth as in regions of greater moisture. One of the most prominent measures of protection in dry regions is the organization of what are known as water reservoirs. Nearly all plants of such regions have leaves which are known as fleshy, that is, they are thick and juicy, being reservoirs of stored-up moisture which is doled out cautiously according to the needs of the plant, without any wastefulness. J. M. COULTER.

THE MISTLETOE

Among the plants sacred and closely allied to the mystic life of a portion of the human race there is none more interesting and rich in legend than the mistletoe. This was associated with religious observances before the time of Christ, and is mentioned by our earliest historians.

There are over seventy species of this peculiar plant.

Both the American variety (*Phoradendron flavescens*) and the European, or true mistletoe (*Viscum album*), belong to a family of parasites, so called because they derive their nourishment entirely or in part from some other plant, instead of taking it directly from the soil. Owing to the presence of the green coloring matter *(Chlorophyll)* in the stems and leaves, the mistletoe is not entirely parasitic, but is to a certain extent self-supporting, drawing but a portion of its nourishment from the tree on which it grows.

It is found both on deciduous and on evergreen trees. In some locations in Europe it is especially abundant on the apple tree, and, if in the right climate, there are few tree species which are exempt from serving as its host.

The mistletoe is an evergreen, shrubby plant of slow growth, attaining a length of about four feet, and its duration of life is practically that of the tree on which it grows. The leathery leaves and rugged stems are yellowish-green in color, and, in the axils of the leaves, are the small and insignificant flowers, which ripen about Christmas-tide into pearly white translucent berries.

At Christmas-tide the mistletoe is largely used for decorative purposes, especially in England, where the custom is ancient, and also in our own land, where each holiday season finds more and more of this unique plant gracing chandelier and window, until we, too, may some day find our maids all kissed—"Under the mistletoe bough."

WILLIAM K. HIGLEY.

PITCHER PLANT.
(Nepenthes)

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PITCHER PLANT

Prominent among the carnivorous plants are the Pitcher Plants, whose leaves form tubes, or urns, or pitchers of various forms, which contain water, and to which insects are attracted and drowned. There is a very common pitcher plant in our northern bogs in whose urn-like leaves insects are found drowned, but which does not have such elaborate arrangements for their capture as other forms. Perhaps the most famous of the pitcher plants is one which is common throughout the Southern States. The leaves are shaped like slender hollow cones and rise in a tuft from the swampy ground. The mouth of this conical urn is over-arched and shaded by a hood in which are translucent spots like small windows. Around the mouth of the urn are glands which secrete a sweet liquid, and drops of this nectar form a trail down the outside of the urn. Inside, just below the rim of the urn, is a glazed zone so smooth that insects cannot walk upon it. Below the glazed zone is another zone thickly set with stiff downward-pointing hairs, and below this is the liquid in the bottom of the urn. If a fly is attracted by the nectar drops on this curious leaf, it naturally follows the trail up to the rim of the urn, where the nectar is abundant. If it attempts to descend into the urn it slips on the glazed zone and falls into the water, and if it attempts to escape by crawling up the side of the urn the thick-set downward-pointing hairs prevent. If it seeks to fly away from the rim it flies towards the translucent spots in the hood, which look like the way of escape, as the direction of entrance is

in the shadow of the hood. Pounding against the hood, the fly falls into the water. This southern pitcher plant is known as a great fly-catcher, and is frequently used for this purpose in the South.

The very largest of the pitcher plants is one which grows in the swamps of California, whose leaves sometimes become as much as two or three feet high, the huge pitchers forming the most capacious receptacle for insects of all kinds and sizes. Its general plan is like that of the southern pitcher plant described above, in that it has an overarching hood with translucent spots and a trail of nectar which leads to the dangerous rim. It has become further elaborated, however, in that the hood extends into a gaudy fish-like appendage, whose colors and flapping serve to attract the flying as well as the creeping insects. The pitcher, also, instead of being straight, is spirally twisted, and has a wing-like expansion which serves as a guide in the spiral ascent to the rim, and leads the victim with definiteness and certainty to the region of danger. The fish-tail appendage is also smeared with the nectar secretion, so that any flying insect lighting upon it is enticed under the overshadowing arch and is almost sure of capture.

The most common pitcher plants of the tropics are the Nepenthes, one of which is shown in our illustration. It will be noticed that each leaf when fully formed consists of three distinct regions, namely, the leaf-like blade, which is continued into a tendril which coils around a support, and the tendril in turn ends in a curiously formed pitcher, which has a more or less complete lid. These pitchers are often mottled with bright colors, and as they swing at the ends

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CACTI.

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of the tendrils they seem to attract the attention of roving insects. Around the rim of the pitcher a very definite row of glands may be observed, which secrete the nectar to which the insects are attracted. The arrangements within the pitcher are such as have been described for the ordinary pitcher plant. These pitchers of Nepenthes are usually found containing insects, and often very many of them, whose bodies are being slowly digested and the products absorbed by the plant. J. M. COULTER.

THE CACTUS

Because the Greeks in olden times applied the word Cactus to a prickly plant, Linnæus, often called the Father of Botany, gave the same name to our wonderful American growth, and since his time these strange and varied plants have borne this nomenclature.

We can hardly imagine any group of plants more interesting. There are over eight hundred varieties of curious and unexpected forms, bearing tubular or rotate flowers most varied in size and color — white, pink, purple, yellow, crimson, deep red — all beautiful and fascinating, and in our northern country protected in the conservatories. The Night-blooming Cereus is most renowned, most admired of all.

The cacti are commonly found in the United States, in Mexico, and in South America, and some species are cultivated on the borders of the Mediterranean Sea, where the fruit is eaten.

They vary in size from an inch or two in height to enor-

mous growths of fifty or sixty feet *(Cereus giganteus)*, which stand like telegraph poles, sometimes nearly bare, sometimes with many vertical branches, reminding one of a huge candelabra. Then, again, some forms are nearly spherical, while others are long, jointed, and square; one species *(Echinocactus visnaga)* grows about nine feet in height, with a diameter of three feet or more, and a single plant of this species will sometimes weigh a ton. One of our most common forms is flat and broad. This, the Prickly Pear or Indian Fig *(Opentia Vulgario)*, is the only species found as far north as Wisconsin and New York.

As many of the cacti require but little care, they are quite extensively cultivated, not only for the rare beauty of their flowers, but for economic purposes. However, nearly all are worthy of culture because of their peculiar forms. W. K. Higley.

COTTON

Cotton is an important annual plant from which the vegetable fiber of commerce is grown. The different varieties are natives of the tropical parts of Asia, Africa, and America, but are now grown far into temperate zones. The fruit is a three to five celled capsule, springing open when ripe, and containing many seeds wrapped in cotton fiber, one to three inches long, which constitute the cotton of commerce. The best is the long staple silk cotton known as Sea Island cotton, which is grown principally on the islands and coast of Georgia, South Carolina, and Florida. The finest kinds of cloth are spun from Sea Island and Egyptian

COTTON.
(Gossypium barbadense.)

A. W. MUMFORD, PUBLISHER, CHICAGO

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cotton. Cotton is also combined with silk, wool, linen, or alpaca in the manufacture of certain kinds of goods. The most perfect system of cultivation is now used in the United States, where most of the cotton of the world is raised. The seed is usually planted in March in furrows. Blooming occurs early in June, and picking usually begins in August and lasts until the frost stops further growth of plants. It is dried and ginned, or separated from the seeds, and packed ready for shipment. The process of separating seed from fiber was formerly done by hand, but the invention of the cotton gin by Eli Whitney in 1793 revolutionized the cotton industry. Formerly the manufacture of cotton in the United States was confined almost exclusively to the New England States, but of recent years thriving factories for the coarser grade varieties have sprung up in the South, and this industry is rapidly growing in importance.

Besides cotton fiber, other by-products of the cotton industry are of great importance. Cotton seed is rich in oil, which is now extensively used in making lard and in other ways. Cottonseed cake is also used as a cattle food and the cottonseed meal is also becoming an important article of food. Pulp is now also successfully made from the cotton stalks, from which is made the finest of writing paper, etc.

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